C4725-1

October 7, 1981
TWO DOLLARS

Implement & Tractor

The business magazine of the farm & industrial equipment industry

INSIDE SHORTLINES: DEALERS TELL ALL IN I&T SURVEY

I&T SINCE 1886

page 12

Looking at the Seal of Quality program by FEMA [illegible]

Previewing Las Vegas Conventions of FEWA, FEMA, AIMRA page 16

In the I&T **Manufacturers Edition**
The pay picture for farm equipment engineers

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Implement & Tractor

The business magazine of the farm & industrial equipment industry

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15: **Dealer Comments on Shortlines.** Our survey on shortlines brought in some revealing remarks about shortline products. Here is a cross-section of the comments received.

16: **FEWA, FEMA and AIMRA Return to Las Vegas.** I&T previews the programs and events for the annual conventions of the Farm Equipment Wholesalers Assn., Farm Equipment Manufacturers Assn., and the Agricultural & Industrial Manufacturers Representatives Assn. to be held Nov. 8-11 in Las Vegas.

26: **FEMA's Seal of Quality Program.** The Seal of Quality means various things to different people, depending on whether you are a manufacturer, dealer or consumer. I&T presents some viewpoints, followed by a listing of shortliners who have qualified to use the seal on their products.

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what's ahead...

I&T
SINCE 1886

October 7, 1981

U.S. RETAIL SALES IN AUGUST returned to their generally dreary postures after some strong performances in July, according to the Farm & Industrial Equipment Institute's flash report. One exception was in combines, which were up for the month and are up for the year to date. Another was four-wheel-drive tractors. The strength shown in July was attributed to particularly intense price discounting by manufacturers to cut inventories and thereby reduce their interest costs. The full report:

	Unit Retail Sales					
	August			January-August		
	1981	1980	Pct. Change	1981	1980	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
40-100 hp	3,431	3,464	- 1.0	35,897	40,397	-11.1
Over 100 hp	3,027	3,486	-13.2	27,860	30,773	- 9.5
Total 2-wheel drive	6,458	6,950	- 7.1	63,757	71,170	-10.4
4-wheel-drive	645	604	+ 6.8	6,409	6,233	+ 2.8
Total Tractors	7,103	7,554	- 6.0	70,166	77,403	- 9.3
Combines (S-P)	2,410	2,115	+13.9	13,077	11,602	+12.7
Balers*	1,461	1,750	-16.5	10,695	10,763	- 0.6
Forage Harvesters**	879	972	- 9.6	3,990	4,747	-15.9
Mower Conditioners	1,808	1,999	- 9.6	14,672	14,680	- 0.1

*Bales under 200 lbs. **Shear-bar type.

HOW MUCH DOES IT COST TO PRODUCE CROPS? USDA's Economic Research Service has built tables showing how much it cost to produce an acre or a bushel of corn, wheat, soybeans, and other crops, showing two figures for each--excluding land and including land--for 1981 (projected) and the three previous years. Some examples:
Corn--In 1979, $1.62 per bushel excluding land, $2.12 with land cost; in 1981, $2.38/bu. excluding land; $3.11 with land cost.
Wheat--In 1979, $2.79/bu. ex. land, $3.72/bu. land included; in 1981, $4.13/bu. ex. land, $5.32/bu. with land.
Soybeans--In 1979, $3.60/bu. ex. land, $5.15/bu. with land; in 1981, $4.97/bu. ex. land, $7.41/bu. without.
Rice--In 1979, $7.08/cwt. ex. land, $8.30/cwt. with land; in 1981, $9.94/cwt ex. land, $11.51/cwt. with land.
Cotton--In 1979, 63.3¢/lb. ex. land, 72.2¢/lb. with land; in 1981, 89.8¢/lb. ex. land, $1.01/lb. with land.

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I&T survey probes

DEALERS' ATTITUDES ABOUT SHORTLINES

The verdict: They've come a long way in dealers' eyes, but there's still abundant ground to cover. Strength shown in such areas as reliability, communicating with dealers, pricing and margins. Important concerns: financing packages, trade territories.

By Bill Fogarty

■EVERY YEAR, when October 7 rolls around, I&T takes a look at some facet of the shortline end of this business. This year, we thought it would be good to get a dealer viewpoint of the shortline product and the people who bring it to him.

Sounds simple. Cook up the questions, send them to dealers. Tally the results and print them.

The problem starts with definition. What is a shortline product? What makes one company a long-line company and another a shortliner? Some majors make only one or two product lines and have other manufacturers make a few allied products for them, but they are called long-line.

Some manufacturers called "shortline" out of custom have grown to a point at which they are comparable with the bottom end of the major scale.

And some companies are true shortliners, by anyone's definition.

Thus, when we sent our survey form to dealers, we asked them to supply their own definition. Risky? Perhaps, but people in this industry have been talking about shortline manufacturers for many years, and there is a general understanding of the term.

Second part of the problem: We had to ask dealers to generalize their answers about shortline companies. The questions were spiced with modifiers like "frequently," "often," "generally," "sometimes," "usually," and so on.

This was done in spite of the fact that there are hundreds of shortline manufacturers. Even the most experienced dealer could only have experience with a handful of them. And a dealer who has had experience with only two would have had to balance out his opinion between them in answering our query.

Thus, we took this survey knowing that its findings would have to be interpreted carefully to have any value. For instance, we asked dealers to agree or disagree with the statement that the shortliner (or distributor) usually has adequate service backup, including training. Forty-two per cent agreed or strongly agreed. Forty-nine per cent disagreed or strongly disagreed.

To us, this indicates that most shortline producers at least need to review their own level of service performance, in comparison with other shortliners, with major manufacturers and—most important—with dealers' expectations.

Another statement: "Compared with long-line products, shortliners' products are generally less reliable."

Twenty-six per cent of dealers agreed with that. Another 22 per cent said there was no difference. And 51 per cent disagreed. To us, that means that reliability efforts of shortliners have been paying off. But considering that dealers have indicated in other surveys that their major suppliers are far from perfect, shortliners have a way to go, too.

The survey threw seven agree-disagree statements at dealers about shortline brands in comparison with long-liners. There were 11 other ones that dealt with shortline products alone. But in considering the responses to these, it is prudent to bear in mind that the dealer's experience with all his suppliers comes into play.

For instance, "Shortline products generally produce an attractive profit margin" found 52 per cent of dealers in agreement and 38 per cent disagreeing. Only nine per cent indicated no opinion. Considering that most responding dealers have experience with the profit margins obtained with long-line products, a comparison probably took place in their minds as they answered.

I&T mentioned to a pair of veteran shortline advocates that 55 per cent of dealers said they *disagreed* with this one: "Shortline suppliers generally give the dealer more trade territory on a line than the major supplier does." Thirty per cent agreed with it; the rest had no opinion.

"That's a complete surprise to me," said one. Another was surprised at first, but on thinking it over, said he was aware that some salesmen habitually overcrowd their territories, usually to their regret.

Survey background

I&T sent questionnaires to 1200 dealers and got back 218 usable responses. Of the respondents, 28 per cent had total equipment sales volumes under $1 million in the past 12 months. Another 34 per cent had volumes from $1 million to $2 million. Twenty-one per cent were from $2 million to $3 million and 17 per cent were over $3 million.

Shortline volume. We asked dealers to tell us what per cent of their volume came from sales of shortlines and shortline parts. Here's what they reported:

Pct. of Sales Volume from Shortlines	Pct. of Dealers Responding
1-9%	21%
10-14	21
15-19	9
20-29	18
30-44	18
45-59	7
60+	6
	100%

These dealers were asked to indicate if this percentage had changed to any degree up or down over the past five years. Fifty-eight per cent of the dealers said the level stayed about the same. Another 24 per cent said the shortline share of volume was higher today; 16 per cent said it was down.

Shortline inventory. We asked dealers if high interest rates had forced them to reduce their shortline inventories. Not surprisingly, 87 per cent said yes; 13 per cent said they had not. Going beyond that, we asked those who had cut to indicate how much they had cut their shortlines "below normal levels."

(More...)

Shortline Products, Sales and Marketing Services: Dealers Give Their Views

	How Dealers Reacted (per cent of replies)				
Statement	**Strongly Agree**	**Agree**	**No Opinion**	**Disagree**	**Strongly Disagree**
Quality of shortliners' literature, manuals for assembly, repair, owners is generally okay.	3	50	4	38	4
Shortliner (or distributor) usually has adequate service backup, including training.	2	40	9	43	6
Shortline products' appearance often deteriorates too fast, makes selling harder.	10	40	15	32	3
Shortline firm (or distributor) usually has attractive co-op advertising program.	2	35	13	41	8
Some shortline products carry a thing called the Seal of Quality. This is important when considering a new product.	1	22	39	33	4
Shortline manufacturers usually maintain good two-way communications with dealers.	5	53	10	30	1
Distributor sales reps usually know the products in their catalog sufficiently.	5	68	6	18	3
Distributor sales reps usually understand the needs of farmers in the specific dealer's area.	3	43	18	33	3
Shortline manufacturers are less innovative than they used to be.	1	31	39	29	0
Shortline products generally produce an attractive profit margin.	4	48	9	34	4
If the shortline product is good, farmers don't care if it is made overseas or in North America.	5	43	15	35	2

Shortlines Survey *(continued)*

Pct. Inventory Cut Below Normal Level	Per Cent of Dealers Who Cut Inventory
1-20%	20%
21-39	26
40-59	39
60-100	15
	100%

Thirty per cent of these dealers said they cut shortline inventory by half. A couple of dealers said they cut their shortlines by 100 per cent. This, of course, takes us back to the problem of definition of shortlines, but this reporter has yet to find a dealership that gets *literally* everything from one supplier.

How did shortline inventory cuts compare with reductions in long-line inventories? Fifty-five per cent of these dealers said their cuts were about the same for both long-line and shortline. Another 38 per cent cut a bigger percentage of their shortlines than they cut majors' supplies. And 7 per cent cut more major-line inventory than shortlines.

The question that is of intense concern to shortline manufacturers is, what will it take to persuade dealers to begin restocking inventories? The answer is almost always, lower interest rates—but how much lower?

So we asked dealers, "About how low will interest rates have to be for you to feel encouraged to restock shortlines to your normal levels?"

Shortlines and Long-lines: Dealers Evaluate Seven Statements

Statement	How Dealers Reacted (per cent of replies) Strongly Agree	Agree	No Difference or No Opinion	Disagree	Strongly Disagree
Long-line supplier generally has more attractive financing packages than shortline manufacturers.	39	52	4	4	1
Long-line manufacturer's man knows as much about his firm's products as shortliner's representative knows about his.	14	47	12	23	3
When a dealer carries a shortline much like one the major firm markets, there is sometimes pressure to drop the shortline.	10	52	15	22	1
Shortline suppliers generally give the dealer more trade territory on a line than the major supplier does.	4	26	14	45	10
Compared with long-line products, shortliners' products are generally less reliable.	3	23	22	47	4
Shortline product parts service is generally as good as or better than long-line firm's parts service.	1	22	15	48	13
Shortline products are generally priced lower than competing long-line products.	10	57	12	19	1

Seven out of ten dealers (72 per cent) said the interest rates would have to be from 10 to 12 per cent before they'd be restocking at former normal levels. A small fraction (7.5 per cent) said they were waiting until the rates were somewhere between 5 and 9 per cent. The remaining dealers (20 per cent) expected to be back in the game with interest rates between 13 and 15 per cent. And one respondent glumly scribbled, "Probably never" on this part of the return.

Calling on dealers

It has often been said that a key reason for shortliners holding their own in the marketplace is that their salesmen work their territories with great intensity. So we asked dealers to estimate how many in-person calls they or their sales managers get, in a typical month, from sales reps for shortline products (in-

(Continued on page 47)

We don't normally do this, but...

When I&T staffers put one of these exclusive reports together, we like to keep it under wraps until publication date so we can surprise everybody. But as we reviewed the early results of our survey among dealers, we leaked our findings to Harold Halter, executive vice-president of the Farm Equipment Manufacturers Assn. His responses indicated surprise and pleasure on some matters and resolute acceptance on others. In a few cases, he indicated he felt that the dealers were just plain wrong.

Example: "With the rest of the world paying farm loan rates as high as 150 per cent, the feeling among dealers that they won't restock shortline inventories to normal levels until rates drop to 10-12 per cent is a pipe dream. They'll return when farmers decide the interest rate is consistent with commodity prices, and some people believe this is around 16 per cent."

Halter said he wasn't surprised at dealers' views about shortline profit margins, problems with appearance and literature. The strong showing for overseas-made products "really surprised me; I thought that 'made in U.S.A.' was more important." He said that one of the most pleasant surprises was the number of calls shortline sales representatives were making.

Halter concluded: "Obviously, some of the (dealer) attitudes hurt, but it's better to know what resistance we face than to go blissfully on, assuming that we're the greatest....Ask the same questions five years from now, and we'll do better!"

Our study produced these DEALER COMMENTS

In most I&T editorial surveys, we leave a little room at the end of the questionnaire for respondents to write in some thoughts, amplifications, objections and general comments. Here is a cross-section of what came in.

"It is easier to make good profits on shortlines. Today with large ticket items being somewhat slower, shortliners can help keep things going."

"I like the way shortline manufacturers treat me. Longline tends to take me for granted or even worse. Shortliners give me the impression that I am somebody special."

"The shortline product itself is not as important as is the distributor for it. We buy from the distributors that give us good service."

"Shortliners usually lead the way with many new methods and machines several years before the major lines design and engineer a similar machine."

"This survey was unfortunately general enough to group all shortline companies together. Many of our shortline suppliers (e.g. Krause, Lindsay, Herman) have excellent sales and service backup, as well as good co-op advertising help. Other shortlines, the majority of ones that walk in our door, are poor help and should be tossed out the door."

"Generally we don't get terms with shortline products, which would provide time to market products before they come due. We need more service people from all companies we do business with."

"It is hard to make money on shortline implements as everyone carries them. For some dealers who sell them, making $100 on a deal is really doing something. They tell the purchaser the dealer down the road has parts and service. We only service what *we sell,* not other dealers. I am a John Deere dealer."

"We are well satisfied with the product and service from our shortline supplier. They are close to our dealership to save us freight and we can get parts in a short time. Their sales people and service people are knowledgeable and they are nice to do business with."

"When money is tight dealers cannot afford to risk their major line by putting more dollars into shortlines. Terms and discount

(Continued on page 51)

Shortlines Survey

(Continued from page 15)

cluding distributor salesmen).

As you might expect, replies ranged all over the map. Five per cent of dealers set it at one call. One dealer told us that *50* calls a month were typical. Another said 40. (Neither said that all 40 or 50 callers actually got in to see the dealer or sales manager!)

The most frequent mentions among dealers were six calls (15 per cent), 10 calls (14 per cent), four calls (11 per cent), five calls (10 per cent), three calls (9 per cent), and eight calls (8 per cent). If we disregard the two dealers who need revolving doors, it averages out to between seven and eight shortline sales calls a month.

How about calls from long-line manufacturers' sales and marketing people? We asked, indicating that service personnel were not to be included.

Almost all correspondents got from one to four calls a month from their major suppliers. One call—19 per cent; two calls—38 per cent; three calls—15 per cent; four calls—17 per cent.

One dealer told us he gets 15 long-line visits a month. Another said 18 and a third said 20. We can only speculate: (a) They are located in a branch-house town; (b) these are superdealers of super value to their suppliers; or (c) they must be in big trouble.

Too broad?

Was I&T's shortline survey too ambitious? Was it too much to take all but a handful of the industry's manufacturers and lump them into a single category? A few dealers complained about this in their comments. "Could have given better answers if you had told us which definition of shortline to use," said one.

But setting up a precise definition of a shortline manufacturer to which dealers would have had to adhere probably would have killed the survey. And we felt the survey needed taking.

We think we have shed some light with this study, and perhaps we have blown away a few myths. We are certain we have given everybody—long-line firms, shortliners, distributors and dealers—some thoughts to ponder. ☐

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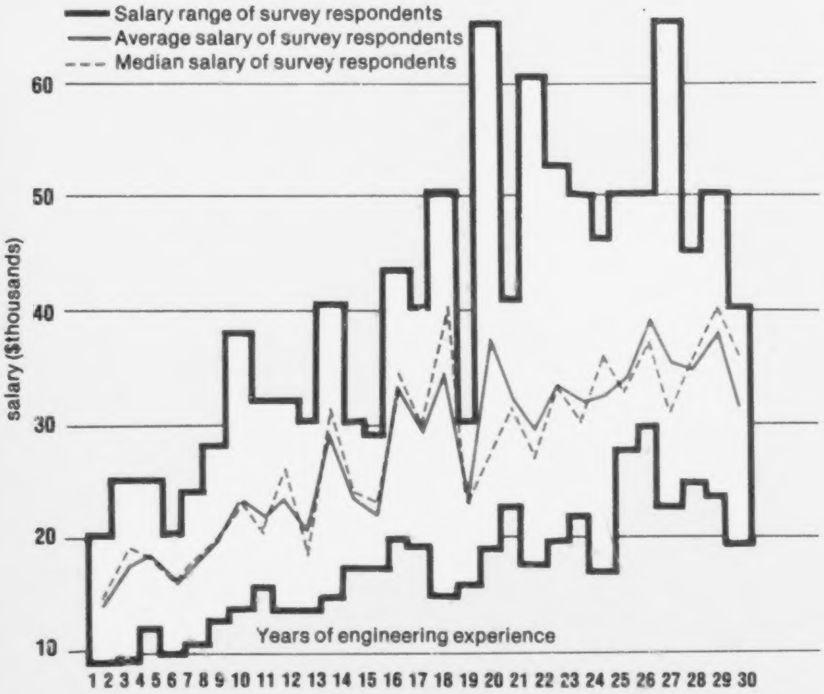
Circle (27) on Reply Card

The pay picture for farm equipment engineers

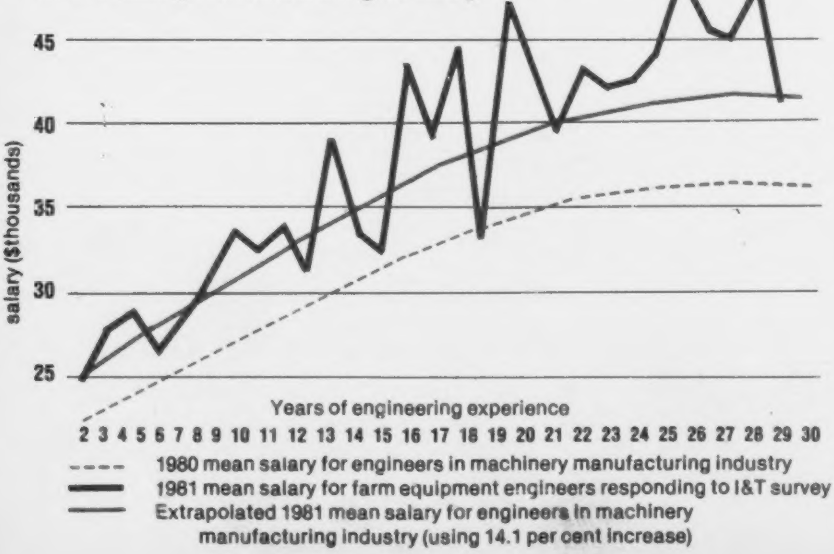
By Chuck McMurray

Survey shows farm equipment engineers faring well compared to colleagues in most other industries

Graph 1. Salary/experience comparison



Graph 2. Salary comparison: Survey respondents vs engineers in machinery manufacturing industry



■THE FIGURES are in, and the farm boys are doing OK! That's what our survey results say.

Earlier this summer I&T mailed questionnaires to nearly 1000 engineers working for farm equipment manufacturers. In one area of inquiry, we asked them to tell us, anonymously, the number of years of engineering experience they had, their current salary, the per cent their salary changed over the past five years, and their highest level of education. Our final tally showed the return mails had provided us with slightly less than 300 completed returns containing usable answers.

Sizeable salary spread

The experience of our respondents ranged from the neophyte engineer in the second year at his first position to the veteran with more than 40 years on the job. For purposes of our report, we eliminated those returns with longevity exceeding 30 years and those with job titles indicating primary responsibility in areas other than engineering. Even then we found a salary spread of nearly $50,000 at some longevity points. We suspect the extremely high salaries included bonuses.

The salaries ranged from slightly below $20,000 to $75,000. Graph 1 shows the average and median salaries plotted according to experience. The sawtooth characteristic of the curve is attributed to the small sample. A

(More...)

Graph 3. Salary increase over past five-year period

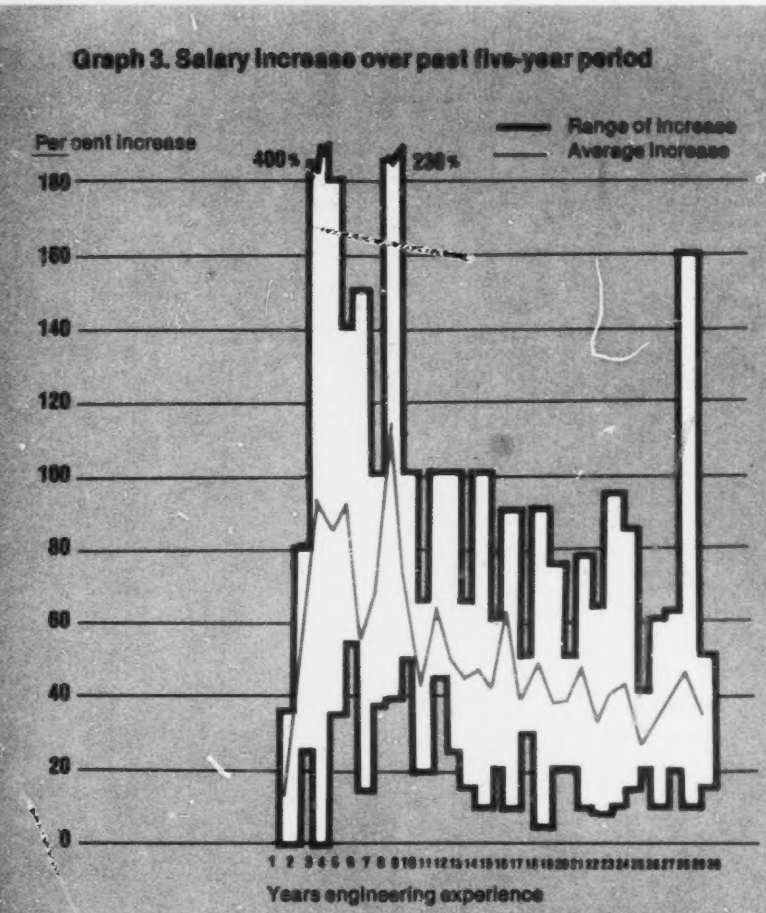


Table 1. Average salary advantage of advanced degrees over bachelor degree.

Experience	Per cent with advance degrees	Avg salary advantage
less than 5	20	$2,130
5 through 9	42	$3,910
10 through 14	24	$4,880
15 through 19	33	$5,440
20 through 24	26	$3,860
25 through 30	20	$5,550

Salaries

(continued)

smooth curve drawn through the points of the average-salary curve would yield a nearly linear curve rising at the rate of approximately $750 per year of experience.

Favorable comparison

Is this relatively small sample truly representative of salary levels among farm equipment engineers? This concern led us to the American Association of Engineering Societies.

One AAES project is an annual survey of engineering salaries, covering many disciplines, functions, and other variables. At this writing, that project was not yet complete for 1981, but a determination had been made that salaries for engineers working in the machinery manufacturing industry (a category that included farm machinery companies) had risen an average of 14.1 per cent in the past year. Graph 2 shows the 1980 average salaries for these engineers (as reported by AAES), and I&T's projected curve of the 1981 salary averages constructed by applying the 14.1 per cent increase to the 1980 figures. As can be seen, the projected curve compares closely with the curve plotted from the average-salary data of the I&T survey of farm equipment engineers.

Five-year increase

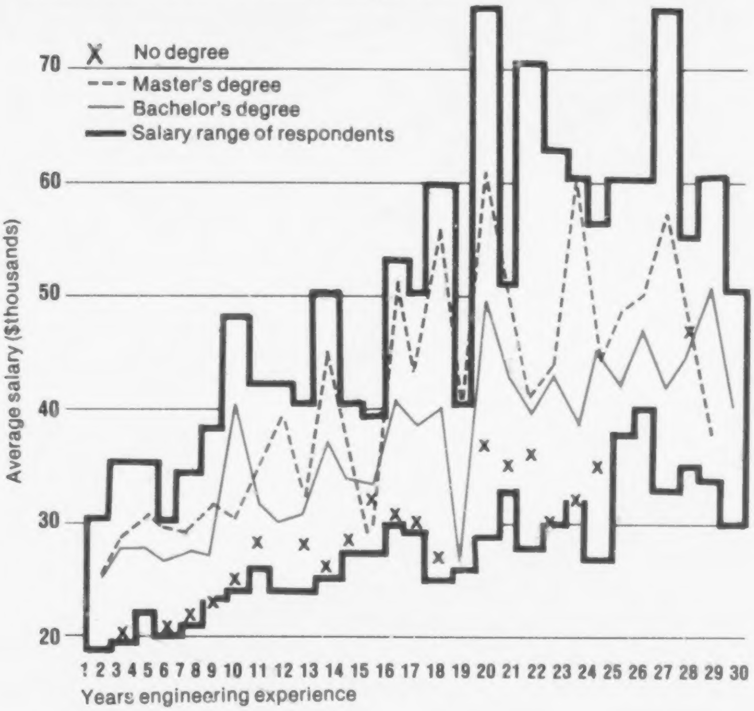
Survey data on salary increase over the past five years showed a definite trend. Engineers with less than five years' experience reported increases from zero to 400 per cent. The increases for those with more than five years' experience ranged from a low of six per cent to a high of 230 per cent. Graph 3 is a plot of the average of the five-year increases reported by respondents to the I&T questionnaire. A smoothed curve drawn between the points of this curve would show that the average increase over the past five years for those at the five-year point would be about 85 per cent. As longevity increases, the five-year increases would drop off in a nearly linear fashion to about 30 per cent for those at the 25- to 30-year point.

Education and dollars

The influence of education on salary is very evident in the data plotted in graph 4. Despite the small sample size, the difference in average salary between those with less than a college education, those with a bachelor's degree, and those with an advanced degree is clear. For the respondents to the I&T survey, table 1 lists the average

(More...)

Graph 4. Education/salary comparison



Salaries

(continued)

salary advantage the engineers with advanced degrees hold over those with only bachelor degrees.

Annual increase

According to a source at the American Association of Engineering Societies, the figures for 1981 show the average annual salary increase for all engineering disciplines to be 9.6 per cent. This is well below the 14.1 per cent reported for engineers in the machinery manufacturing industry, of which the farm equipment industry is a part.

The average salary increase over the past five years was approximately 53.8 per cent for the survey respondents. That approximates an annual 9 per cent increase compounded for the five-year period, a figure which lagged the rate of inflation for that period, but which exceeded the rate of salary increase realized in most industries.

Yes, all in all, the farm equipment guys have held their own. ☐

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Could you learn to love your parts business like Don Hill loves his? page 8

Servicing Electronics in Ag Equipment page 10

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October 21, 1981 • Vol. 96 • No. 21

Implement & Tractor

The business magazine of the farm & industrial equipment industry

in this issue...

8: **Could You Learn to Love Your Parts Business Like Don Hill Loves His?** A three-time turn with a volume around 35 per cent of total—and careful management by well-trained people—would make it easy.

10: **Electronics in Ag Equipment: What's the Dealer Service Angle?** How proficient will the dealer's service department have to be in dealing with electronic devices? Theory is not essential, but ability and equipment for diagnosis will be.

18: **The 50 Series From Deere.** A look at Deere & Co.'s new big four-wheel-drive tractors being shown to dealers and consumers at major fall farm shows.

26: **IH: Five Two-Wheelers, 90 to 185 HP.** Forward air cooling is a major feature of International's five new tractors introduced to dealers last month.

On the cover... Don Hill's Circleville, Ohio, dealership showroom is filled with displays of farm equipment parts in visual storage.

DEPARTMENTS

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I&T
SINCE 1886

AUCTION PRICES OF USED EQUIPMENT

An exclusive I&T monthly report of actual prices paid recently at these leading national wholesale auctions.

Asterisk beside tractor price indicates highest bid offered on tractors which were not sold.

JONES FARM EQUIPMENT
Dothan, Alabama
September 8, 1981

ALLIS-CHALMERS TRACTORS

7080 diesel, cab, 1978 (Good)	16,500*
7040 diesel, cab, duals, 1977 (Good)	12,500*
7040 diesel, duals, 1977 (Good)	10,500*
7020 diesel, cab, 1978 (Good)	11,500*
WD, 1950 (Good)	475

CASE TRACTORS

1070 diesel, 1970 (Fair)	3200
970 diesel, 1974 (Fair)	2850
530 diesel, 1963 (Good)	2200

DEUTZ TRACTOR

4506, (Fair)	2350

DAVID BROWN TRACTOR

990 diesel, 1967 (Excellent)	2300*

MASSEY-FERGUSON TRACTORS

1085 diesel, 1975 (Excellent)	7300
210 diesel, 1960 (Excellent)	3700*
175 diesel, 1974 (Excellent)	4500*
175 diesel, 1973 (Excellent)	4700
175 diesel, 1971 (Good)	4000
175 diesel, 1971 (Good)	4000
165 diesel, 1968 (Good)	3300
165 diesel, 1968 (Good)	3250
165 diesel, 1967 (Good)	3350
135, 1966 (Fair)	2050
135, 1966 (Fair)	2350
135, 1966 (Good)	3200
65, diesel, 1963 (Good)	2050
65 diesel, 1959 (Good)	1875
50, 1962 (Fair)	1100
35, 1963 (Good)	1600*
35, 1960 (Fair)	1300*
35 diesel, 1958 (Good)	1100
35, 1958 (Fair)	1275
35, 1957 (Good)	1650
35, 1957 (Good)	1850
35, 1956 (Good)	1600
35, 1956 (Good)	1600
30, 1952 (Fair)	825
30, 1952 (Good)	1000
30, 1952 (Excellent)	1400
20, 1950 (Good)	1125
20, 1948 (Good)	1150*
20, 1948 (Good)	1225*

FORD-FERGUSON TRACTOR

9N, 1946 (Fair)	550

FORD TRACTORS

8700 diesel, 1977 (Good)	7900
8600 diesel, cab, 1974 (Good)	5600*
8600 diesel, 1974 (Good)	5000*
7700 diesel, 1978 (Excellent)	13,750
TW20 diesel, 1979 (Good)	14,900*
TW20 diesel, 1979 (Good)	15,000*
TW20 diesel, 1979 (Excellent)	15,900
5000 diesel, 1974 (Excellent)	5700*
4000 diesel, 1968 (Rough)	1900*
4000, 1963 (Fair)	1500
3400 diesel, ldr., backhoe, 1972 (Good)	4600*
3000 diesel, 1972 (Good)	3600*
Sup. Dex. 1963 (Excellent)	2700
861 diesel, 1958 (Fair)	1500
860, 1956 (Excellent)	2450
641, 1960 (Good)	2000*
641, 1958 (Good)	2000
Jub., 1953 (Good)	1625
Jub., 1953 (Fair)	1275
8N, 1952 (Good)	1300
8N, 1950 (Good)	1175
8N, 1950 (Good)	1200
8N, 1949 (Good)	1100

INTERNATIONAL HARVESTER TRACTORS

756 diesel, 1969 (Fair)	3100
706 diesel, 1964 (Fair)	3000
574 diesel, 1972 (Excellent)	5400
574 diesel, 1972 (Good)	4300*
3414 diesel, ldr., backhoe, 1962 (Good)	3200*
B414 diesel, 1962 (Good)	1375
Sup. C, 1949 (Fair)	325
100, cult., 1955 (Good)	1625
Cub, 1949 (Good)	1100
Cub, mo., 1949 (Good)	1300

JOHN DEERE TRACTORS

6030 diesel, duals, 1973 (Excellent)	8700*
4630 diesel, duals, 1974 (Good)	10,500*
4620 diesel, duals, 1972 (Good)	9100*
4430 diesel, 1974 (Good)	9600*
4230 diesel, cab, duals, 1975 (Good)	12,000
4020 diesel, 1968 (Good)	5000*
3020 diesel, 1969 (Excellent)	6100*
3020 diesel, 1968 (Good)	4700
3010, 1962 (Fair)	2200
3010 diesel, 1962 (Good)	3050*
2240 diesel, 1978 (Excellent)	6100
2030 diesel, 1974 (Good)	5000*
2020 diesel, 1966 (Good)	3800*
2010 diesel, 1963 (Fair)	1050*
2010, 1963 (Fair)	950
400 diesel (Fair)	1450*
40, cult., plt., plow, mo., 1954 (Good)	750
B, 1942 (Rough)	150

LONG TRACTORS

900 diesel, 1975 (Good)	2450
384 diesel, 1971 (Rough)	1100
384 diesel, 1971 (Rough)	1050

KUBOTA TRACTORS

245 diesel, 1979 (Excellent)	3850
L185 diesel, turbo, 1979 (Excellent)	3700

OLIVER TRACTORS

1850 diesel, 1966 (Good)	3300
1655 diesel, 1975 (Good)	3500
1655 diesel, 1975 (Fair)	3100
1655 diesel, 1974 (Good)	3750
1600 diesel, 1963 (Fair)	1400
770 LP, 1960 (Fair)	775
550, 1964 (Good)	1925*

NOTES
Prices reported are for individual sales at wholesale on "as is," "cash and carry" basis.
Prices reported are NOT averages.

Condition classifications: EXCELLENT means—Engine: in perfect condition, 400 to 600 hours of use; Rubber: 80% tread remaining, no breaks or cracks; Paint: original and bright; General Appearance: excellent.

GOOD means—Engine: good running condition; Rubber: 70% tread remaining, no breaks or cracks; Paint: original paint or a good repaint job; General Appearance: good over-all.

FAIR means—Engine: possibly in need of a minor overhaul to restore; Rubber: 60% tread remaining, some cracking evident in side walls; Paint: only fair, weathered and some rust apparent; General Appearance: worn, some dents, minor parts such as gage covers missing or broken.

ROUGH means—Engine: obviously in need of a major overhaul; Rubber: smooth; Paint: scarred, weathered, rusty, needs painting urgently; General Appearance: dents, ruptures, broken parts, loose wires, some components such as lights broken, missing or inoperative.

DEMONSTRATOR means—used for demonstrating only and in practically new condition.

Don't sell too low...

and don't pay too much...

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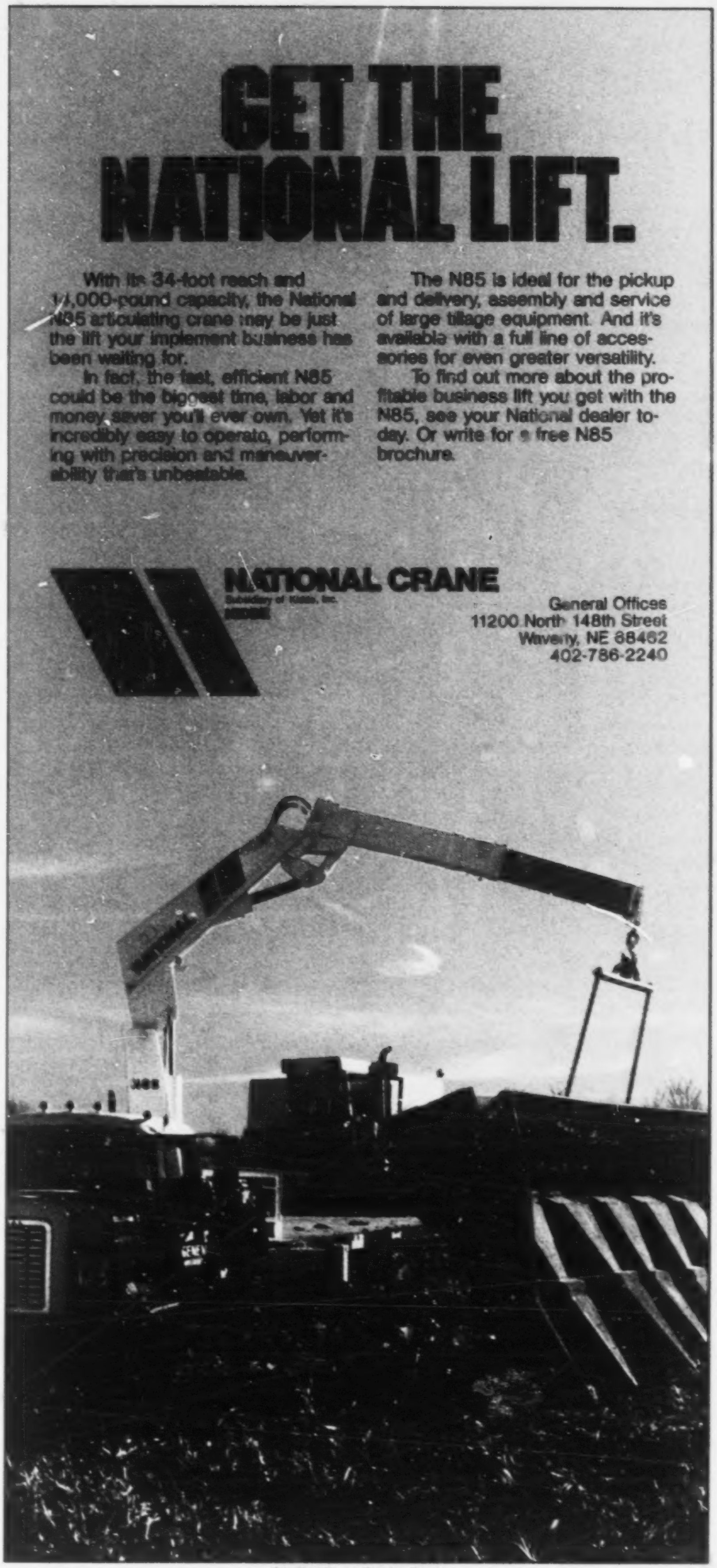
RETAIL SALES OF SELECTED FARM EQUIPMENT – Jan.-July, 1980 and 1981(1)
(In Units)

	Combines Self-Propelled		Corn Heads		Hay Balers(2)		Windrowers Self-Propelled: Power Units		Windrowers Self-Propelled: Total Heads		Grinder-Mixers		Shear-Bar Forage Harvesters(3)	
	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
Alabama	85	75	22	21	87	144	2	.....	1	.....	88	57	6	26
Alaska	2	.....	.....	.....	10	10	.....	.....	.....	.....	1	1	.....	.....
Arizona	34	56	.....	1	28	40	47	43	57	51	6	3	6	10
Arkansas	185	335	.....	1	138	214	.....	2	.....	2	47	30	4	11
California	150	216	13	26	110	126	185	203	206	221	3	4	34	37
Colorado	189	170	46	39	242	236	132	129	142	132	44	42	31	17
Connecticut	.....	1	.....	.....	42	35	.....	.....	.....	.....	.....	.....	11	14
Delaware	13	15	9	10	7	7	1	1	1	1	7	5	5	1
Florida	37	18	27	10	42	46	.....	1	.....	1	28	10	14	11
Georgia	174	234	121	91	110	148	1	.....	1	.....	176	67	37	42
Hawaii	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....
Idaho	99	201	8	3	403	339	240	191	239	195	37	20	34	24
Illinois	838	850	790	732	236	177	15	8	15	9	330	252	111	113
Indiana	501	428	522	400	203	227	6	6	6	6	241	159	85	61
Iowa	908	893	910	874	190	217	93	103	98	110	785	582	254	180
Kansas	1,144	896	135	57	207	218	204	190	206	200	160	105	101	64
Kentucky	115	139	70	74	202	212	3	25	3	28	223	128	57	66
Louisiana	110	138	3	2	31	74	.....	.....	.....	.....	12	6	11	7
Maine	2	2	.....	.....	46	49	2	.....	2	.....	.....	1	17	13
Maryland	56	41	53	50	80	58	8	4	8	4	27	17	29	27
Massachusetts	.....	.....	.....	.....	33	33	6	.....	6	.....	1	.....	7	7
Michigan	145	189	124	133	210	192	41	33	42	34	157	128	176	134
Minnesota	461	620	350	362	464	443	349	343	358	348	372	348	341	290
Mississippi	155	173	1	6	46	92	1	.....	1	.....	25	23	29	19
Missouri	389	485	184	118	322	377	51	36	54	37	346	221	56	52
Montana	192	289	2	2	210	186	215	257	228	280	45	24	17	14
Nebraska	592	555	407	326	125	130	188	174	197	186	341	229	117	107
Nevada	1	1	.....	.....	28	23	27	27	30	29	2	2	7	4
New Hampshire	.....	.....	.....	.....	40	37	.....	.....	.....	.....	.....	2	8	10
New Jersey	10	5	8	5	21	22	.....	.....	.....	.....	6	6	8	5
New Mexico	19	29	5	1	82	86	42	34	44	34	9	6	.....	1
New York	44	36	67	46	471	377	44	32	45	33	81	70	318	257
North Carolina	116	121	102	97	204	190	2	.....	2	.....	104	74	30	25
North Dakota	357	664	14	21	29	45	236	348	248	377	89	75	38	38
Ohio	446	364	344	287	327	332	6	8	6	8	259	173	119	109
Oklahoma	355	397	6	3	306	382	77	82	83	84	84	50	16	15
Oregon	89	104	4	5	292	217	149	130	157	149	19	14	22	26
Pennsylvania	69	68	84	48	491	468	38	35	40	35	202	138	235	189
Rhode Island	.....	.....	.....	.....	3	1	.....	.....	.....	.....	.....	.....	1	.....
South Carolina	76	76	34	22	49	59	.....	.....	.....	.....	44	22	15	16
South Dakota	229	257	88	74	52	53	325	272	352	288	217	127	100	87
Tennessee	126	121	52	24	314	365	1	2	1	2	137	92	43	50
Texas	586	870	128	118	434	781	65	63	71	76	138	102	53	41
Utah	12	25	1	1	228	206	71	73	72	76	21	7	29	19
Vermont	.....	1	.....	.....	83	79	2	3	2	4	.....	2	65	50
Virginia	54	47	44	36	305	215	6	6	6	6	65	38	62	46
Washington	175	256	13	12	298	243	119	84	118	96	14	7	64	50
West Virginia	.....	2	.....	2	109	102	.....	.....	.....	.....	18	8	2	7
Wisconsin	141	165	173	167	917	787	234	167	236	168	344	292	938	710
Wyoming	25	36	1	4	107	134	96	96	96	99	14	11	10	9
U.S. Government	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miscellaneous (4)	.....	3	.....	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
TOTAL	**9,506**	**10,667**	**4,966**	**4,323**	**9,014**	**9,234**	**3,330**	**3,211**	**3,480**	**3,409**	**5,369**	**3,780**	**3,775**	**3,111**

Data released September 22, 1981, Farm & Industrial Equipment Institute.

(1) Includes revisions for prior months.
(2) For making bales of under 200 lbs.
(3) Pull-type, mounted, self-propelled.
(4) Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

Mower Conditioners All Types 1980	1981	Manure Spreaders Conveyor-Type 1980	1981	
95	127	15	10	Alabama
2	9	1	2	Alaska
8	11	6	5	Arizona
258	350	70	65	Arkansas
30	36	26	31	California
95	91	49	35	Colorado
64	35	49	42	Connecticut
14	6	43	34	Delaware
33	44	19	17	Florida
164	161	33	17	Georgia
.....	.....	1	.....	Hawaii
96	110	69	64	Idaho
402	387	401	349	Illinois
329	373	314	323	Indiana
685	664	873	866	Iowa
374	433	152	91	Kansas
609	676	210	188	Kentucky
31	56	18	12	Louisiana
64	67	68	43	Maine
72	70	158	98	Maryland
36	33	49	51	Massachusetts
399	305	486	438	Michigan
681	704	816	773	Minnesota
53	77	11	16	Mississippi
892	1,058	232	173	Missouri
89	125	34	15	Montana
306	298	268	126	Nebraska
4	6	5	2	Nevada
47	37	40	26	New Hampshire
36	20	35	27	New Jersey
11	18	5	4	New Mexico
733	661	832	832	New York
172	167	104	79	North Carolina
70	140	66	46	North Dakota
526	472	545	474	Ohio
444	494	41	22	Oklahoma
197	145	71	47	Oregon
618	516	824	692	Pennsylvania
2	2	.....	.....	Rhode Island
53	91	22	9	South Carolina
44	74	135	124	South Dakota
436	570	129	94	Tennessee
749	1,090	99	103	Texas
105	126	79	54	Utah
136	111	144	125	Vermont
539	365	158	97	Virginia
167	143	88	59	Washington
117	111	42	41	West Virginia
1,573	1,156	1,319	1,181	Wisconsin
23	40	29	17	Wyoming
.....	.....	.....	.....	U.S. Government
.....	.....	.....	.....	Miscellaneous
12,683	**12,864**	**9,283**	**8,039**	**TOTAL**



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RETAIL SALES OF WHEEL TRACTORS*

(In Units)

	Total Wheel Tractors†				Cumulative for Jan.-July, 1980				Cumulative for Jan.-July, 1981			
	July, 1980		July, 1981		Farm Type				Farm Type			
	Farm	Non-Farm	Farm	Non-Farm	2-Wheel Drive	4-Wheel Drive	Total Farm	Non-Farm	2-Wheel Drive	4-Wheel Drive	Total Farm	Non-Farm
Alabama	180	28	170	29	1,481	51	1,532	236	1,072	22	1,094	193
Alaska	1	6	1	3	11	6	17	19	16	1	17	33
Arizona	50	49	108	23	468	58	526	283	429	45	474	236
Arkansas	222	42	337	26	2,031	213	2,244	308	1,666	206	1,872	196
California	452	288	568	158	2,557	214	2,771	1,607	2,518	282	2,800	1,255
Colorado	151	69	133	41	662	118	780	391	615	131	746	270
Connecticut	24	17	20	6	167	3	170	117	111	2	113	78
Delaware	8	8	14	8	100	5	105	25	77	2	79	20
Florida	281	106	240	102	1,466	46	1,512	691	1,338	41	1,379	645
Georgia	307	64	225	43	2,040	33	2,073	321	1,497	18	1,515	319
Hawaii	8	3	6	5	36	1	37	58	37	5	42	45
Idaho	117	11	114	19	620	73	693	87	797	143	940	94
Illinois	406	78	581	71	2,871	446	3,317	479	2,685	482	3,167	424
Indiana	305	39	280	25	1,775	271	2,046	289	1,496	229	1,725	203
Iowa	474	15	665	30	3,248	329	3,577	172	3,371	394	3,765	149
Kansas	458	29	459	5	2,024	433	2,457	217	1,496	319	1,815	150
Kentucky	355	42	293	84	2,563	45	2,608	292	2,102	27	2,129	313
Louisiana	255	52	383	68	1,667	162	1,829	362	1,727	152	1,879	440
Maine	44	4	21	9	152	2	154	56	144	3	147	45
Maryland	45	27	56	31	428	24	452	188	323	15	338	213
Massachusetts	30	27	16	11	99	.....	99	155	98	.....	98	144
Michigan	220	88	265	42	1,392	138	1,530	486	1,447	216	1,663	374
Minnesota	325	21	437	20	2,157	329	2,486	236	2,439	366	2,805	171
Mississippi	245	43	297	17	2,050	167	2,217	235	1,564	116	1,680	167
Missouri	312	50	403	22	2,305	144	2,449	355	1,942	176	2,118	249
Montana	150	24	148	13	708	166	874	138	540	166	706	86
Nebraska	226	16	296	15	1,947	225	2,172	107	1,678	171	1,849	94
Nevada	17	10	6	10	77	7	84	78	48	7	55	71
New Hampshire	11	14	23	9	82	.....	83	54	77	.....	77	54
New Jersey	28	55	22	31	184	2	186	293	136	.....	136	254
New Mexico	32	24	45	13	266	15	281	137	215	25	240	133
New York	267	100	263	54	1,498	61	1,559	542	1,353	108	1,461	430
North Carolina	281	67	228	51	2,054	31	2,085	389	1,578	29	1,607	329
North Dakota	138	11	250	14	797	419	1,216	82	1,079	465	1,544	57
Ohio	299	82	288	43	2,194	213	2,407	516	1,791	227	2,018	390
Oklahoma	420	97	414	39	1,633	238	1,871	379	1,395	180	1,575	400
Oregon	148	30	143	11	810	43	853	224	708	58	766	169
Pennsylvania	194	111	202	47	1,344	36	1,380	631	1,164	40	1,204	476
Rhode Island	2	1	.....	.....	11	.....	11	27	13	.....	13	18
South Carolina	111	44	146	30	965	32	997	213	701	25	726	211
South Dakota	165	5	235	3	868	139	1,007	52	820	154	974	37
Tennessee	273	62	252	22	1,964	57	2,021	258	1,613	38	1,651	189
Texas	1,072	345	1,585	356	5,725	355	6,080	2,131	5,819	353	6,172	2,163
Utah	52	34	56	26	383	17	400	197	385	17	402	169
Vermont	53	5	35	4	201	.....	201	21	184	3	187	30
Virginia	178	54	156	22	1,371	19	1,390	343	962	14	976	229
Washington	195	32	182	42	1,095	98	1,193	260	877	107	984	253
West Virginia	45	20	43	12	316	.....	316	126	213	.....	213	80
Wisconsin	393	53	386	15	2,803	122	2,925	292	2,552	159	2,711	224
Wyoming	44	17	55	7	204	24	228	100	234	25	259	96
U.S. Government	68	154	1	13	138	.....	136	537	9	.....	9	60
Miscellaneous‡	38	60	33	88	228	.....	228	424	148	.....	148	403
TOTAL	**10,175**	**2,735**	**11,585**	**1,888**	**64,236**	**5,630**	**69,866**	**16,219**	**57,299**	**5,764**	**63,063**	**13,533**

Data released September 22, 1981, Farm & Industrial Equipment Institute.

*Figures do not include garden tractors, motor tillers or contractors off-highway types. Report includes units marketed by these firms: Allied Farm Equip. (Leyland Satoh); Allis-Chalmers; Belarus; J I Case; Deere; Deutz; Ford; International Harvester; Long; Massey-Ferguson; R. M. Wade (Satoh); Steiger; Versatile; and White.

†The monthly sales are those reported for that month only. The cumulative totals are subject to revision reflecting updating in the basic sales data.

‡Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

C4725-1

November 7, 1981
FOUR DOLLARS

Implement & Tractor

The business magazine of the farm & industrial equipment industry

44th MARKET STATISTICS ISSUE

RETAIL SALES

LATEST IMPORT-EXPORT DATA

EQUIPMENT ON FARMS

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The business magazine of the farm & industrial equipment industry

44th ANNUAL STATISTICS ISSUE

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On the cover...At the Massey-Ferguson store at Antioch, Ill., G. A. Ammon directs L. D. Luiskman in the loading of a combine. (Photo courtesy Massey-Ferguson)

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what's ahead...

I&T
SINCE 1886

November 7, 1981

SEPTEMBER'S RETAIL SALES OF FARM EQUIPMENT in the U.S., according to the flash report of the Farm & Industrial Equipment Institute, fell off substantially in most categories. Farm wheel tractor volume was off by a third from September 1980, as were combine sales. For the first nine months, however, combines, conventional balers and mower-conditioners were about even with the first three quarters of last year. The FIEI flash report:

	Unit Retail Sales					
	September			January-September		
	1981	1980	Pct. Change	1981	1980	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
40-100 hp	3,626	4,998	-27.5	39,326	45,395	-13.4
Over 100 hp	3,004	4,974	-39.6	30,864	35,747	-13.7
Total 2-wheel drive	6,630	9,972	-33.5	70,190	81,142	-13.5
4-wheel drive	729	1,044	-30.2	7,138	7,277	- 1.9
Total Tractors	7,359	11,016	-33.2	77,328	88,419	-12.5
Combines (S-P)	2,772	4,132	-32.9	15,851	15,734	+ 0.7
Balers*	1,017	1,195	-14.9	11,859	11,958	- 0.8
Forage Harvesters**	1,263	1,678	-24.7	5,253	6,425	-18.2
Mower Conditioners	1,596	1,661	- 3.9	16,260	16,341	- 0.5

*Bales under 200 lbs. **Shear-bar type.

CANADIAN RETAIL SALES ALSO FELL OFF IN SEPTEMBER, according to the flash report of the Canadian Farm & Industrial Equipment Institute, but the industry's performance for the first nine months of 1981 showed considerable strength.

	Unit Retail Sales					
	September			January-September		
	1981	1980	Pct. Change	1981	1980	Pct. Change
Farm Wheel Tractors	1,942	3,033	-36.0	19,857	20,768	- 4.4
Mower-Conditioners	303	438	-30.8	3,474	3,705	- 6.2
Balers*	350	580	-40.0	2,744	3,453	-20.5
Combines (S-P)	795	905	-12.2	3,260	2,531	+28.8

*Bales under 200 lbs.

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Editor's Notebook
(continued)

turn which has two different formulas:

1. Stock order purchases, divided by inventory.

2. Stock order performance times gross turn.

"...My own personal view is that much of what the parts manager does is right, gleaned from years of experience. But as these managers are gradually replaced by a younger breed, many of the old skills which had been acquired intuitively are not transferred. The new manager must learn all of these skills over again by making the same mistakes that his predecessor made. In the seminars we conduct, our goal is to make the computer system an extension of the part's manager's proper operating methods.

"Unfortunately, many of these computer systems do not feel the needs nor do they address themselves to the very basic requirements of inventory management...."

Re: Wil-Rich Cultivator Clearance: We Blew It

When we did our report on the Prairie Agricultural Machinery Institute's study of 10 cultivators, we made a serious typographical error. We reported the shank lift height on Wil-Rich's 13CPW heavy-duty cultivator at 3.6 inches. Wrong. It should have been 13.6 inches, the highest among the 10 units reported. Sorry.

AUCTION PRICES OF USED EQUIPMENT

An exclusive I&T monthly report of actual prices paid recently at these leading national wholesale auctions.

Asterisk beside tractor price indicates highest bid offered on tractors which were not sold.

YODER & FREY, INC.
Archbold, Ohio
(October 13, 1981)

ALLIS-CHALMERS TRACTORS

545B, Idr.,	11,500
XT190, 1964 (Rough)	2900*
170, 1968 (Good)	3775
160 diesel, 1970 (Rough)	1600*
D17, 1959 (Fair)	1400*
WD45, 1951 (Rough)	710
WD45, 1950 (Good)	925
WD45, 1949 (Fair)	575
C, (Rough)	420

CASE TRACTORS

1370 diesel, 1971 (Good)	7950
1070 diesel, 1972 (Fair)	8500*
1030 diesel, 1967 (Good)	4500*
1030 diesel, 1967 (Fair)	3550*
830, 1965 (Fair)	1500*
830 diesel, 1965 (Fair)	1300*
830 diesel, 1964 (Fair)	1300*
580B, Idr., (Good)	5650
530, 1956 (Rough)	1460
400, 1956 (Rough)	1100*
310, Idr., 3250	3250

COCKSHUTT TRACTORS

1600, 1962 (Rough)	1900
570, 1954 (Rough)	600*
30, 1949 (Fair)	560

DAVID BROWN TRACTORS

1200 diesel, 1965 (Rough)	2100
1200 diesel, (Rough)	1100*
990 diesel, 1970 (Rough)	2500
900 diesel	2050
900, 1958 (Rough)	500

JOHN DEERE TRACTORS

4620 diesel, (Fair)	8300
4430 diesel, 1975 (Good)	13,550
4230 diesel, 1976 (Good)	13,700*
4020 diesel, 1970 (Good)	8400*
4020 diesel, 1967 (Good)	7500
4020 diesel, 1967 (Good)	7300*
4020 diesel, 1967 (Good)	6800*
4010 diesel, 1963 (Good)	4800*
4010 diesel, 1961 (Fair)	3800*
3010 diesel, 1965 (Good)	3675
3010 diesel, 1964 (Fair)	2900*
3010 diesel, 1961 (Rough)	2650
2520, 1970 (Good)	4150
830 diesel, 1958 (Rough)	2000
820 diesel, 1956 (Rough)	1400
720, 1956 (Rough)	1100
720 LP, 1956 (Rough)	950*
70, 1953 (Fair)	1000*
430, 1958 (Fair)	925
A, 1948 (Rough)	625
B, 1949 (Fair)	450
M, plow, cult.,	900
LA, plow, cult., (Fair)	790

FORD TRACTORS

8000, 1972 (Fair)	6300
5000, 1975 (Good)	6550
5000, 1972 (Fair)	4300*
5000, 1969 (Rough)	3400*
4000, 1971 (Good)	3325
4000	1170
4000, (Rough)	1050*
3000, Idr., 1969 (Fair)	3000*
3500, Idr.,	2200*
971, Idr., 1957 (Fair)	1150
900, 1957 (Fair)	1100*
900 diesel, 1957 (Fair)	750
861, Idr., 1957 (Fair)	2125
621, Idr., 1956 (Fair)	1700*
Dexta, 1956 (Fair)	1050*
Dexta, 1955 (Rough)	1300*
Jub., 1952 (Fair)	1700*
Jub., 1953 (Rough)	1500
8N, 1952 (Fair)	1450*
8N, Idr., 1951 (Good)	1500*
8N, 1951 (Fair)	1300
8N, 1951 (Rough)	1125
8N, 1950 (Fair)	1250
8N, 1950 (Fair)	1125
8N, 1950 (Fair)	1100
8N, 1950 (Rough)	1025
9N, 1945 (Fair)	950
9N, mo., 1945 (Good)	850*
9N, 1945 (Rough)	760
9N, 1944 (Rough)	835

FERGUSON TRACTORS

35, 1962 (Fair)	900
20, (Rough)	520

INTERNATIONAL HARVESTER TRACTORS

1468 diesel, 1975 (Good)	7750
1466 diesel, 1976 (Fair)	8000*
1466 diesel, 1976 (Fair)	7000
1066 diesel, 1973 (Fair)	8500*
1066 diesel, 1973 (Fair)	7800*
1066 diesel, 1972 (Fair)	7500*
1066 diesel, 1972 (Rough)	7100*
806 diesel, 1965 (Good)	4975
806, 1964 (Rough)	2225
706 diesel, 1967 (Fair)	3750*
706, 1966 (Fair)	2650*
706 diesel, 1965 (Good)	4725
706, 1965 (Fair)	2800*
706, 1965 (Fair)	2475
656 diesel, 1969 (Fair)	2850*
656, 1969 (Fair)	2600*
656, 1966 (Good)	3200*
656, hydro., 1966 (Fair)	2175
600 diesel, 1965 (Rough)	925
560 diesel, 1960 (Good)	1700*
560, 1960 (Good)	1650*
560, 1959 (Good)	1700*
460 diesel, 1959 (Fair)	1450*
460, 1958 (Rough)	925
454, 1969 (Fair)	2900*
434,	1750
350, 1957 (Good)	1125*
350,	730
M, 1954 (Fair)	775
M, 1951 (Rough)	540
M, 1950 (Rough)	700
M, (Rough)	460
H, 1949 (Fair)	400
Sup. A, cult., 1947 (Good)	1150
Sup. A, 1947 (Good)	1125
A, 1946 (Fair)	710
A, (Rough)	500*
C,	550
C, cult., (Rough)	425

MASSEY-FERGUSON TRACTORS

2244, dozer,	3625
1080 diesel, 1969 (Rough)	3800
275, 1976 (Fair)	6400*
202, Idr.,	2000
Sup. 90 diesel, 1957 (Rough)	1600*
65 diesel, 1960 (Rough)	1800
50, 1958 (Fair)	2000
35 diesel, 1955 (Fair)	1450*

MINNEAPOLIS-MOLINE TRACTORS

G1000 Vista, 1963 (Good)	2800*
445, 1959 (Fair)	1650

OLIVER TRACTORS

2655 diesel, 1972 (Rough)	5250*
1955, 1972 (Rough)	4000*
1900, 1961 (Rough)	1600*
1850, 1966 (Good)	2100*
1800, 1960 (Rough)	2200*
1750, 1967 (Good)	2800*
1655 diesel, 1975 (Good)	5500
1600 diesel, 1961 (Rough)	2300
770, 1961 (Fair)	575*
88, 1950 (Rough)	480

WHITE TRACTORS

4-180 diesel, duals, 1977 (Good)	15,500
2-105, 1974 (Fair)	10,750*
1870, 1969 (Good)	6150

TRACTOR, COMBINE RETAIL A SIX-YEAR

By Bill Fogarty

■WHAT'S HAPPENED in the U.S. farm equipment business in the past six years? In this brief space, we hope to give you a glimpse of what has been happening with the two most significant product groups of the industry—tractors and combines.

The two tables also provide a look at where changes have taken place, *i.e.,* in the individual states.

We have also added to the bottom lines the standing factory and field inventory totals at the end of each year.

Tractors. When we first reviewed variances in farm tractor sales, it appeared that North Carolina would have to be declared a major disaster area. In that state, unit sales for 1975 were at 7,914. By 1980 they had fallen by 55 per cent, according to FIEI data. How could any area stand that?

Then we realized that 1975 and 1976 data include units under 40 hp; the rest do not. And North Carolina had sales of over 2,500 under-40-hp units *recorded* in 1975. Viewed in this context, that state's decline in unit volume appears somewhat more bearable.

A check of nine Corn Belt states (Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Ohio and Wisconsin) indicates that tractor sales volume slacked off 27 per cent

Farm Wheel Tractors Unit Retail Sales, 1975-1980
(40 pto horsepower and over)

	1975*	1976**	1977	1978	1979	1980
Alabama	3,514	3,987	3,213	2,869	2,702	2,202
Alaska	6	13	19	20	28	31
Arizona	638	654	666	755	797	993
Arkansas	4,561	4,376	4,024	3,905	4,013	3,285
California	4,858	4,571	4,317	4,684	5,088	4,818
Colorado	1,595	1,396	919	1,036	1,193	1,331
Connecticut	175	207	145	203	189	236
Delaware	286	282	226	189	255	146
Florida	2,972	2,718	2,467	2,436	2,341	2,593
Georgia	5,581	5,433	3,956	4,178	3,717	2,944
Hawaii	111	117	106	76	56	79
Idaho	1,980	1,845	1,234	1,303	1,263	1,451
Illinois	9,960	9,542	8,561	8,587	7,651	6,442
Indiana	6,010	5,915	5,508	5,540	4,850	3,781
Iowa	10,230	9,066	8,396	9,679	9,671	7,136
Kansas	5,485	4,615	3,394	3,979	4,824	4,322
Kentucky	5,668	5,910	5,043	4,851	4,479	3,871
Louisiana	3,390	2,858	2,843	2,846	2,730	2,930
Maine	315	381	311	245	229	244
Maryland	1,188	1,087	867	813	842	723
Massachusetts	186	186	121	129	144	142
Michigan	4,076	3,916	3,215	3,412	3,256	2,937
Minnesota	6,789	5,490	5,849	7,139	7,096	5,300
Mississippi	3,866	4,037	3,676	3,841	3,541	3,501
Missouri	5,152	5,165	4,685	5,423	5,575	4,089
Montana	1,786	1,580	953	1,252	1,358	1,438
Nebraska	4,809	4,272	3,464	4,282	4,760	3,751
Nevada	84	80	63	82	134	117
New Hampshire	173	201	125	150	146	148
New Jersey	418	453	360	365	315	300
New Mexico	554	547	390	420	463	420
New York	2,919	3,392	2,966	2,930	2,880	2,617
North Carolina	7,914	7,253	4,751	4,584	4,022	3,550
North Dakota	5,273	3,584	2,336	3,401	3,562	2,575
Ohio	6,395	6,434	6,057	6,097	5,004	4,103
Oklahoma	3,619	3,173	2,681	3,003	3,846	2,988
Oregon	1,429	1,612	1,320	1,423	1,385	1,429
Pennsylvania	2,847	3,459	3,055	2,812	2,454	2,178
Rhode Island	25	24	21	26	26	16
South Carolina	2,960	2,788	1,857	1,904	1,851	1,466
South Dakota	2,807	2,016	2,016	2,792	2,712	1,983
Tennessee	4,834	5,285	4,530	4,649	3,964	3,036
Texas	10,963	10,083	9,228	9,169	10,784	10,047
Utah	677	722	559	635	711	660
Vermont	294	484	343	390	404	341
Virginia	3,514	3,250	2,431	2,578	2,516	2,126
Washington	1,920	2,041	1,440	1,771	1,851	2,053
West Virginia	755	800	570	598	594	456
Wisconsin	4,787	5,176	5,121	5,633	6,050	5,002
Wyoming	508	424	316	382	462	410
U.S. Govt.	35	34	181	51	155	220
Misc.	254	252	17	90	49	374
U.S. Total	**161,145**	**153,169**	**130,912**	**139,607**	**138,990**	**119,331**
N. Amer. Export	14,307	12,001	10,810	8,229	5,973	8,425
Inventory, Dec. 31	57,111	60,978	76,855	63,728	71,176	70,710

Source: Farm & Industrial Equipment Institute.
*Includes approximately 23,000 units under 40 hp.
**Includes approximately 16,000 units under 40 hp.

SALES: PERSPECTIVE

from 1975 to 1980. In the five southeastern states of Alabama, Florida, Georgia, North Carolina and South Carolina, the decline was 44 per cent. But, as in the case of North Carolina, a number of under-40-hp tractors were included in 1975 reports and not in 1980.

Combines. In only two of the past six years have combine retail sales dipped below 30,000 units in the U.S. Last year's decline was substantial.

In 1975, of the 33,084 units sold, 8,100 were Class V (or larger) and the rest were Class I through IV. The industry wound up the year with 1,415 Class I-IV and 751 Class V units in inventory. By contrast, in 1980, the size profile had changed. There were sales of 12,545 Class I-IV and 13,196 Class V-VI combines. Similarly, inventory divided about evenly. On hand at the end of the year: 5,997 units in Classes I-IV and 6,073 in V-VI.

Bottom line. We don't show it on the tables, but you may be interested to know, as you study the Dec. 31 inventory lines through the six years for both tractors and combines, that the prime rate was running approximately thus:

1975: 6.75 per cent.
1976: 6.25 per cent.
1977: 7.75 per cent.
1978: 11.75 per cent.
1979: 15.25 per cent.
1980: 21.50 per cent. ☐

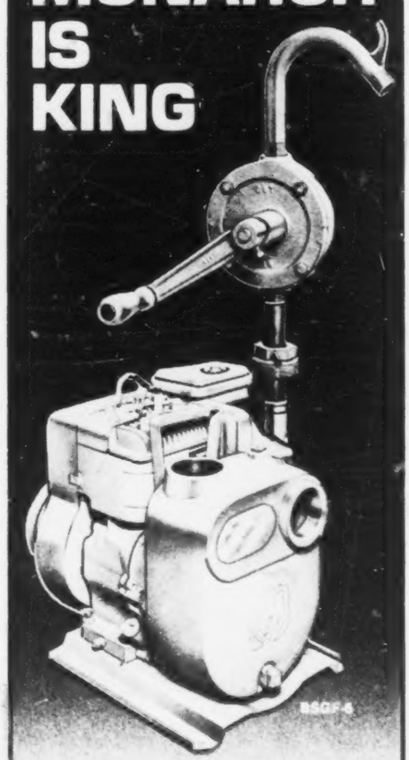
Self-Propelled Combines Unit Retail Sales, 1975-1980

	1975	1976	1977	1978	1979	1980
Alabama	370	409	428	539	504	245
Alaska	1	.....	.....	.....	6	5
Arizona	83	94	55	47	35	60
Arkansas	1,006	933	999	1,045	1,123	672
California	442	447	207	253	237	284
Colorado	273	286	251	249	316	341
Connecticut	.....	2	.....	1	2	.....
Delaware	63	83	58	50	55	43
Florida	102	127	102	165	148	78
Georgia	669	820	564	725	764	384
Hawaii	.....	1	.....	.....	.....	.....
Idaho	381	435	349	360	371	440
Illinois	4,069	3,895	3,452	3,600	3,305	2,708
Indiana	2,249	2,229	1,959	2,048	1,964	1,489
Iowa	3,802	3,507	2,912	3,665	3,474	2,928
Kansas	2,068	1,949	1,595	1,605	1,851	1,888
Kentucky	516	530	559	508	579	363
Louisiana	469	493	622	657	650	447
Maine	9	9	15	8	2	7
Maryland	201	211	184	171	161	149
Massachusetts	.....	1	1	.....	.....	.....
Michigan	680	606	506	562	609	596
Minnesota	1,894	1,624	1,741	2,110	2,085	1,652
Mississippi	586	630	798	806	891	543
Missouri	1,630	1,442	1,459	1,575	1,676	1,043
Montana	457	514	363	456	393	414
Nebraska	1,970	1,764	1,400	1,738	1,845	1,517
Nevada	5	7	9	7	4	3
New Hampshire	.....	.....	.....	.....	.....	.....
New Jersey	48	70	75	68	48	28
New Mexico	55	56	44	21	32	42
New York	183	200	154	171	179	191
North Carolina	658	693	594	591	662	419
North Dakota	1,087	1,174	860	1,182	1,383	1,014
Ohio	1,709	1,646	1,625	1,655	1,654	1,213
Oklahoma	642	746	503	461	620	642
Oregon	206	241	267	248	220	243
Pennsylvania	257	307	307	272	283	198
Rhode Island	.....	.....	.....	.....	.....	.....
South Carolina	375	411	350	355	384	221
South Dakota	612	563	620	712	725	513
Tennessee	562	582	658	686	692	381
Texas	1,300	1,451	1,102	897	966	974
Utah	49	55	44	49	41	40
Vermont	.....	.....	.....	.....	.....	1
Virginia	273	264	206	216	259	125
Washington	487	506	269	328	381	460
West Virginia	2	3	5	4	3	5
Wisconsin	467	430	494	575	611	675
Wyoming	80	63	49	52	52	59
U.S. Govt.	3	.....	1	.....	1	.....
Misc.	34	4	5	1	.....	.....
U.S. Total	**33,084**	**32,513**	**28,821**	**31,494**	**32,246**	**25,741**
N. Amer. Export	.....	1,610	1,538	1,421	1,854	2,654
Inventory, Dec. 31	4,536	4,524	9,665	9,161	8,339	12,070

Source: Farm & Industrial Equipment Institute.

GENERAL PURPOSE PUMPS. HAND PUMPS. ANY PUMPS.

MONARCH IS KING



The Monarch line of pumps includes models from ⅓ to 30 HP — each offering the ultimate in dependability. Illustrated are The Monarch BSGF-6 liquid fertilizer pump, and the Monarch V-100 ¾ inch multi-purpose hand pump.

For further information and specifications, write us now.

A tradition of quality and dependability since 1935.

MONARCH INDUSTRIES
322 West 86th St. P.O. Box 20476
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Circle (7) on Reply Card

FARM TRACTOR HORSEPOWER:

	Two-Wheel-Drive Tractors						
State	40-49	50-59	60-69	70-79	80-99	100-119	120-129
Alabama	629	273	236	129	231	185	46
Alaska	4	9	5	2	4	1	.....
Arizona	73	30	81	105	129	112	14
Arkansas	612	323	275	84	117	75	72
California	596	695	951	475	553	309	69
Colorado	116	105	90	28	100	102	45
Connecticut	60	40	64	21	20	13	.....
Delaware	14	20	23	10	18	17	4
Florida	537	338	534	310	341	198	29
Georgia	775	310	304	202	263	194	75
Hawaii	32	18	9	7	9	1	.....
Idaho	91	119	152	34	180	191	72
Illinois	213	251	409	284	410	551	257
Indiana	272	230	296	169	306	348	147
Iowa	78	150	419	247	606	934	306
Kansas	144	128	174	75	270	477	209
Kentucky	974	802	624	301	444	187	49
Louisiana	546	269	298	121	124	124	51
Maine	67	50	43	11	26	29	2
Maryland	159	103	92	52	71	85	18
Massachusetts	34	41	24	14	19	5	.....
Michigan	280	317	369	176	310	307	81
Minnesota	102	236	469	241	634	784	201
Mississippi	626	274	230	158	226	181	75
Missouri	469	461	489	178	481	378	158
Montana	197	130	148	37	156	135	81
Nebraska	50	58	114	44	308	612	180
Nevada	17	19	15	4	13	14	3
New Hampshire	51	33	31	6	14	8	.....
New Jersey	86	61	38	15	40	19	3
New Mexico	92	37	39	46	27	31	12
New York	258	376	493	191	527	314	39
North Carolina	987	529	426	286	480	258	63
North Dakota	17	32	43	19	79	236	149
Ohio	494	457	473	216	466	414	125
Oklahoma	309	180	181	78	270	389	103
Oregon	361	270	204	54	144	105	21
Pennsylvania	311	375	430	117	386	276	42
Rhode Island	7	4	3	.....	1	1	.....
South Carolina	394	183	177	116	144	99	30
South Dakota	16	35	73	40	233	360	110
Tennessee	877	471	348	157	271	180	52
Texas	1,843	894	915	539	806	709	267
Utah	73	126	122	41	87	61	22
Vermont	44	69	83	23	60	31	1
Virginia	608	397	343	143	263	142	19
Washington	594	534	256	64	150	81	21
West Virginia	196	127	57	35	27	4	2
Wisconsin	146	444	865	401	890	760	202
Wyoming	27	47	29	11	73	55	16
U.S. Government	23	.....	37	49	5	1	.....
Miscellaneous	66	37	45	222	2	.....	.....
TOTAL	**15,647**	**11,517**	**12,648**	**6,490**	**11,814**	**11,081**	**3,543**

THE 1980 STORY

980 Retail Sales of Farm Wheel Tractors by PTO Horsepower (in units)

					Four-Wheel-Drive Tractors					
130-139	140-149	150-179	180 & over	Total 2-Wheel Drive	Under 200	200-249	250 & over	Total 4-Wheel Drive	All Farm Wheel Tractors	State
199	41	106	62	2,137	30	24	11	65	2,202	Alabama
.....	.....	.....	.....	25	.....	4	2	6	31	Alaska
113	38	94	100	889	31	42	31	104	993	Arizona
306	165	452	456	2,937	106	158	84	348	3,285	Arkansas
325	49	232	119	4,373	132	177	136	445	4,818	California
247	28	152	88	1101	76	113	41	230	1,331	Colorado
9	1	2	.....	230	5	1	.....	6	236	Connecticut
18	2	6	5	137	2	5	2	9	146	Delaware
110	24	42	18	2,479	46	50	18	114	2,593	Florida
389	81	180	120	2,893	11	32	8	51	2,944	Georgia
.....	.....	1	.....	77	1	.....	1	2	79	Hawaii
215	56	115	20	1,245	83	95	28	206	1,451	Idaho
1,371	358	1,017	430	5,551	423	316	152	891	6,442	Illinois
683	187	410	218	3,266	232	196	87	515	3,781	Indiana
2,029	556	788	250	6,363	404	267	102	773	7,136	Iowa
894	154	637	393	3,555	290	382	95	767	4,322	Kansas
206	42	103	61	3,793	34	28	16	78	3,871	Kentucky
208	161	340	424	2,666	84	122	58	264	2,930	Louisiana
10	.....	2	1	241	3	.....	.....	3	244	Maine
57	17	29	8	691	12	13	7	32	723	Maryland
3	1	.....	.....	141	1	.....	.....	1	142	Massachusetts
435	90	166	57	2,588	188	110	51	349	2,937	Michigan
1,106	226	424	110	4,533	378	274	115	767	5,300	Minnesota
331	107	563	470	3,241	72	90	98	260	3,501	Mississippi
582	157	323	165	3,841	101	81	66	248	4,089	Missouri
112	37	76	27	1,136	96	134	72	302	1,438	Montana
1,036	240	512	218	3,372	223	112	44	379	3,751	Nebraska
15	1	3	1	105	7	5	.....	12	117	Nevada
3	.....	.....	.....	146	2	.....	.....	2	148	New Hampshire
19	4	4	7	296	3	.....	1	4	300	New Jersey
59	7	40	11	401	8	5	6	19	420	New Mexico
211	31	51	11	2,502	72	23	20	115	2,617	New York
220	60	99	85	3,495	33	16	6	55	3,550	North Carolina
540	120	307	128	1,670	386	378	141	905	2,575	North Dakota
572	132	233	110	3,692	204	133	74	411	4,103	Ohio
650	62	274	119	2,615	162	178	33	373	2,988	Oklahoma
106	13	47	14	1,339	51	29	10	90	1,429	Oregon
128	25	27	9	2,126	28	12	12	52	2,178	Pennsylvania
.....	.....	.....	.....	16	.....	.....	.....	.....	16	Rhode Island
122	31	57	63	1,416	18	25	7	50	1,466	South Carolina
506	73	200	50	1,696	153	96	38	287	1,983	South Dakota
268	57	140	119	2,940	41	30	25	96	3,036	Tennessee
1,651	334	857	608	9,423	276	234	114	624	10,047	Texas
57	12	20	5	626	17	10	7	34	660	Utah
16	3	6	1	337	4	.....	.....	4	341	Vermont
102	22	31	31	2,101	15	8	2	25	2,126	Virginia
91	11	43	8	1,853	86	76	38	200	2,053	Washington
6	1	.....	1	456	.....	.....	.....	.....	456	West Virginia
589	153	204	76	4,730	175	69	28	272	5,002	Wisconsin
59	19	17	15	368	27	6	9	42	410	Wyoming
2	.....	3	.....	220	.....	.....	.....	.....	220	U.S. Government
.....	1	.....	1	374	.....	.....	.....	.....	374	Miscellaneous
16,986	**3,990**	**9,435**	**5,293**	**108,444**	**4,832**	**4,159**	**1,896**	**10,887**	**119,331**	**TOTAL**

ATA: Farm & Industrial Equipment Institute. Figures do not include garden tractors, motor tillers, or contractor's off-highway types. Report includes units marketed by these firms: llied Farm Equip. (Leyland, Satoh); Allis-Chalmers; Belarus; J I Case; Deere; Deutz; Ford; International Harvester; Long; Massey-Ferguson; Steiger; Versatile; R. M. Wade (Satoh); and hite. Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual arketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

RETAIL SALES OF SELECTED FARM EQUIPMENT—Jan.-Dec., 1979 and 1980 (1)

(In Units)

	Combines Self-Propelled		Corn Heads		Hay Balers (2)		Windrowers Self-Propelled				Grinder-Mixers		Shear-Bar Forage Harvesters (3)	
							Power Units		Total Heads					
	1979	1980	1979	1980	1979	1980	1979	1980	1979	1980	1979	1980	1979	1980
Alabama	504	245	107	66	252	153	1	2	1	1	231	135	63	37
Alaska	6	5	.....	.....	9	19	.....	3	.....	4	.....	1	.....	.....
Arizona	35	60	5	7	43	44	63	64	69	76	4	8	16	11
Arkansas	1,123	672	11	5	427	186	2	.....	1	.....	62	82	28	11
California	237	284	65	53	244	174	300	281	327	311	15	5	80	74
Colorado	316	341	166	158	507	437	284	222	289	237	70	68	195	102
Connecticut	2	.....	1	.....	67	58	.....	.....	.....	.....	2	1	68	42
Delaware	55	43	37	44	18	15	.....	1	.....	1	12	8	15	12
Florida	148	78	76	51	113	77	3	.....	3	.....	64	46	26	26
Georgia	764	384	532	302	244	197	1	1	1	1	542	265	133	105
Hawaii	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Idaho	371	440	12	22	505	600	357	404	369	413	48	66	74	75
Illinois	3,305	2,708	3,533	2,821	399	327	15	23	15	23	679	496	365	261
Indiana	1,964	1,489	2,095	1,615	422	316	12	8	12	8	605	390	263	191
Iowa	3,474	2,928	4,191	3,108	459	328	262	137	257	145	2,062	1,290	930	565
Kansas	1,851	1,888	425	343	495	312	411	290	421	300	363	252	348	263
Kentucky	579	363	412	284	455	292	3	3	4	3	345	306	235	182
Louisiana	650	447	2	3	164	68	.....	.....	.....	.....	17	21	26	19
Maine	2	7	.....	.....	89	70	3	2	3	2	1	1	63	46
Maryland	161	149	171	171	137	118	8	13	7	14	51	39	123	77
Massachusetts	.....	.....	.....	.....	59	50	1	6	.....	6	1	3	38	39
Michigan	609	596	592	566	483	382	81	64	85	65	273	263	527	420
Minnesota	2,085	1,652	2,004	1,481	971	735	781	648	804	666	918	629	1,199	873
Mississippi	891	543	10	6	209	79	.....	2	.....	2	70	48	76	62
Missouri	1,676	1,043	939	501	685	436	87	86	89	94	667	509	217	191
Montana	393	414	5	7	413	388	511	443	551	491	87	76	48	37
Nebraska	1,845	1,517	1,816	1,416	257	211	518	307	525	321	633	504	486	359
Nevada	4	3	.....	.....	59	40	76	59	77	63	2	2	6	8
New Hampshire	.....	.....	.....	.....	59	58	1	.....	1	.....	2	.....	39	34
New Jersey	48	26	17	21	65	41	.....	1	.....	1	14	11	32	17
New Mexico	32	42	12	16	168	128	99	63	99	67	19	12	11	9
New York	179	191	287	243	812	769	74	69	74	70	133	129	1,054	853
North Carolina	662	419	530	400	327	303	3	2	3	2	257	162	141	96
North Dakota	1,383	1,014	86	58	96	58	922	588	986	639	194	146	155	144
Ohio	1,654	1,213	1,582	1,132	709	528	14	9	14	9	538	406	391	269
Oklahoma	620	642	15	23	907	407	168	104	172	111	187	131	61	38
Oregon	220	243	13	10	335	413	260	281	265	301	37	33	87	49
Pennsylvania	283	198	305	291	977	751	89	55	90	57	350	321	789	539
Rhode Island	.....	.....	.....	.....	6	7	.....	7	.....	6	1	.....	1	1
South Carolina	384	221	194	131	102	85	.....	.....	.....	.....	127	66	38	37
South Dakota	725	513	540	302	183	98	784	538	842	580	429	332	485	395
Tennessee	692	381	223	156	610	389	1	1	1	1	289	207	229	145
Texas	966	974	278	303	1,445	762	119	86	132	91	270	250	86	85
Utah	41	40	15	10	329	339	156	131	158	144	78	33	97	99
Vermont	.....	1	.....	1	132	110	1	4	1	4	3	.....	177	159
Virginia	259	125	221	127	488	393	7	7	7	7	165	97	259	202
Washington	381	460	71	39	348	432	213	195	226	198	20	21	104	146
West Virginia	3	5	6	7	265	166	.....	1	.....	1	36	28	58	31
Wisconsin	611	675	755	832	1,988	1,481	397	394	401	403	661	542	2,457	1,978
Wyoming	52	59	16	14	214	192	203	197	212	213	33	27	52	45
U.S. Government	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miscellaneous (4)	.....	.....	1	7	.....	.....	.....	.....	.....	.....	6	.....	.....	.....
TOTAL	**32,246**	**25,741**	**22,374**	**17,154**	**18,750**	**14,022**	**7,291**	**5,802**	**7,594**	**6,152**	**11,673**	**8,468**	**12,451**	**9,461**

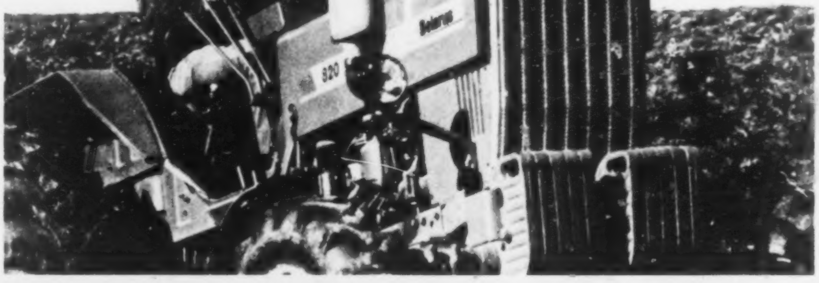
Data released Feb. 18, 1981, Farm & Industrial Equipment Institute.

(1) Includes revisions for prior months.
(2) For making bales of under 200 lbs.
(3) Pull-type, mounted, self-propelled.

(4) Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

Mower Conditioners All Types 1979	1980	Manure Spreaders Conveyor-Type 1979	1980	
242	141	18	18	Alabama
2	8	1	1	Alaska
6	12	9	8	Arizona
574	371	115	89	Arkansas
49	45	86	70	California
166	160	71	58	Colorado
90	96	85	64	Connecticut
18	19	73	58	Delaware
124	87	30	31	Florida
279	229	51	47	Georgia
1	.....	2	1	Hawaii
123	167	137	137	Idaho
773	606	916	593	Illinois
709	529	717	489	Indiana
1,480	1,095	2,391	1,393	Iowa
1,010	638	263	201	Kansas
1,217	817	316	266	Kentucky
126	48	26	29	Louisiana
121	117	119	113	Maine
182	116	230	215	Maryland
81	53	76	72	Massachusetts
786	685	824	750	Michigan
1,474	1,062	1,995	1,537	Minnesota
198	101	31	19	Mississippi
1,787	1,199	441	321	Missouri
129	155	50	51	Montana
623	485	549	345	Nebraska
12	9	7	6	Nevada
70	75	53	59	New Hampshire
80	58	63	55	New Jersey
38	23	8	11	New Mexico
1,265	1,178	1,649	1,545	New York
389	285	166	145	North Carolina
172	140	114	107	North Dakota
1,121	808	1,033	820	Ohio
960	617	36	57	Oklahoma
201	279	135	112	Oregon
1,252	934	1,429	1,222	Pennsylvania
6	4	1	.....	Rhode Island
141	79	32	30	South Carolina
147	91	362	216	South Dakota
943	569	188	156	Tennessee
1,548	1,120	153	144	Texas
168	205	106	118	Utah
253	250	282	223	Vermont
762	674	261	232	Virginia
156	262	150	137	Washington
250	177	99	64	West Virginia
3,202	2,519	3,103	2,253	Wisconsin
74	55	54	37	Wyoming
.....	.....	.....	.....	U.S. Government
.....	.....	1	8	Miscellaneous
25,600	**19,452**	**19,107**	**14,733**	**TOTAL**

MORE work acres per gallon



MORE MARGIN per sale with *Belarus* "fuel misers"

Our dealers are proving, time after time, they can sell Belarus tractors at full margin. The reasons are several.

Original cost per hp, **fuel miser** economy, rugged dependability, fewer breakdowns, easy repair and servicing—less down-time and labor cost—are a few of the "smile reasons" owners come back to buy their 2nd and 3rd Belarus.

One more smile. Our exclusive, automatically engaging on-the-go 4WD on our 57, 70 and 85 hp models is extremely popular. Great for front-end loaders. Helps fuel efficiency too.

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414/355-2000

BM-8102

Circle (8) on Reply Card

Motor Vehicles and Specified Machines on U.S. Farms and Average Prices of Wheel Tractors, January 1, Designated Years[1]

Year	Tractors (exclusive of steam & garden)[2] Thousands	Motor Trucks Thousands	Grain Combines Thousands	Corn Pickers and Picker Shellers Thousands	Pick-up Balers Thousands	Field Forage Harvesters Thousands	Garden Tractors and Motor Tillers[3] Thousands	Wheel Tractors Wholesale Prices[4] Per Unit Dollars	Wheel Tractors Wholesale Prices[4] Horsepower Dollars
1927	693	662	.....	.....	.....	.....	.....	.....	.....
1928	782	753	.....	.....	.....	.....	.....	.....	.....
1929	827	840	.....	.....	.....	.....	.....	.....	.....
1930	920	900	61	50	.....	.....	.....	.....	.....
1931	997	920	.....	.....	.....	.....	.....	.....	.....
1932	1,022	910	.....	.....	.....	.....	.....	.....	.....
1933	1,019	865	.....	.....	.....	.....	.....	.....	.....
1934	1,016	875	.....	.....	.....	.....	.....	.....	.....
1935	1,048	890	.....	.....	.....	.....	.....	.....	.....
1936	1,125	923	.....	.....	.....	.....	.....	.....	.....
1937	1,230	990	.....	.....	.....	.....	.....	.....	.....
1938	1,370	1,042	.....	.....	.....	.....	.....	.....	.....
1939	1,445	1,020	.....	.....	.....	.....	.....	.....	.....
1940	1,545	1,047	190	110	.....	.....	.....	.....	.....
1941	1,675	1,095	225	120	.....	.....	.....	.....	.....
1942	1,885	1,160	275	130	25	.....	.....	.....	.....
1943	2,100	1,280	320	138	31	.....	.....	$ 579	$ 21
1944	2,215	1,385	345	146	34	.....	.....	$ 658	$ 24
1945	2,354	1,490	275	168	42	20	68	$ 665	$ 25
1946	2,480	1,550	420	203	54	25	80	$ 733	$ 28
1947	2,613	1,700	465	236	65	30	122	$ 783	$ 30
1948	2,821	1,900	535	299	90	45	159	$ 890	$ 33
1949	3,123	2,065	620	372	135	60	192	$ 994	$ 35
1950	3,399	2,209	714	456	196	81	216	$ 1,073	$ 37
1951	3,678	2,310	810	522	240	102	242	$ 1,234	$ 42
1952	3,907	2,410	887	588	298	124	268	$ 1,297	$ 42
1953	4,100	2,520	930	630	345	148	296	$ 1,359	$ 39
1954	4,243	2,610	965	660	395	175	315	$ 1,513	$ 39
1955	4,345	2,675	980	688	448	202	332	$ 1,554	$ 39
1956	4,480	2,707	1,005	715	505	220	353	$ 1,682	$ 41
1957	4,570	2,745	1,015	740	560	240	375	$ 1,842	$ 41
1958	4,620	2,775	1,030	755	600	258	400	$ 2,111	$ 46
1959	4,673	2,800	1,045	775	645	270	425	$ 2,189	$ 48
1960	4,688	2,834	1,042	792	680	291	450	$ 2,338	$ 49
1961	4,743	2,850	980	740	685	291	468	$ 2,578	$ 50
1962	4,763	2,885	960	730	703	300	485	$ 2,819	$ 51
1963	4,778	2,925	940	720	718	307	500	$ 3,046	$ 53
1964	4,786	2,970	920	705	734	312	513	$ 3,443	$ 53
1965	4,787	3,030	910	690	751	316	699	$ 3,541	$ 56
1966	4,783	3,017	888	686	752	316	725	$ 3,886	$ 58
1967	4,786	3,009	867	680	748	319	750	$ 4,257	$ 62
1968	4,766	3,016	847	673	739	321	770	$ 4,709	$ 66
1969	4,712	3,004	820	657	725	314	790	$ 4,976	$ 71
1970	4,619	2,978	790	635	708	304	805	$ 5,560	$ 76
1971	4,562	2,985	760	629	698	309	815	$ 6,190	$ 80
1972	4,509	2,993	725	625	687	315	825	$ 6,486	$ 84
1973	4,477	3,006	703	618	680	324	835	$ 6,953	$ 85
1974	4,478	3,020	685	618	677	332	850	$ 7,294	$ 86
1975	4,463	3,032	666	615	666	337	870	$ 8,459	$ 91
1976	4,434	3,043	647	610	642	342	890	$11,220	$112
1977	4,381	3,052	630	605	614	346	905	$12,692	$124
1978	4,350	3,054	615	600	595	345	917	$13,431	$144
1979	4,990	3,555	664	694	769	376	1,060	$16,512	$149
1980	4,960	3,566	677	690	761	381	1,075	$18,139	$166
1981	4,925	3,577	690	685	752	386	1,085	$22,376	$187

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[1] SOURCE: Reports of the USDA and the Bureau of the Census. After 1959, Alaska and Hawaii are included. On-farm data after 1970, except 1975 and 1979, are estimated by I&T.

[2] Consists of Wheel and Crawler Tractors only after 1944. Prior to 1945 some Garden Tractors may have been included but the number was small.

[3] Motor Tillers included after 1964.

[4] Estimated at wholesale level by dividing **Value of Manufacturers' Shipments** by **Units Shipped** and by **Maximum Belt Horsepower**, data are published in "Current Industrial Reports" of the Bureau of the Census.

Note: Data from the 1978 Census (Jan. 1, 1979 above) and later years, reflect changes in data collection, resulting in improved coverage by the Census and are not fully comparable with earlier years.

Principal Machines on Farms – 1981

	WHEEL AND CRAWLER TRACTORS						TRACTOR MOLDBOARD PLOWS	
STATE	1959 Census Number	1964 Census Number	1969 Census Number	1974 Census Number	1978[1] Census Number	Estimated July 1, 1981 Number	Estimated July 1, 1958 Number	Estimated July 1, 1981 Number
Maine	17,793	16,290	14,252	13,493	15,064	15,550	12,400	9,050
New Hampshire	6,605	6,253	4,953	4,989	5,584	5,980	4,600	2,800
Vermont	16,669	16,333	15,227	14,706	16,322	16,450	10,200	9,800
Massachusetts	12,068	11,575	9,537	9,341	10,902	11,700	8,800	6,000
Rhode Island	1,651	1,687	1,359	1,359	1,684	1,780	1,000	850
Connecticut	11,219	9,963	8,679	7,924	9,169	9,270	7,700	5,500
New York	138,670	136,304	122,645	118,313	128,248	131,000	107,000	80,800
New Jersey	24,726	22,042	19,984	19,324	22,991	23,300	21,500	17,250
Pennsylvania	144,759	144,149	126,810	124,251	142,844	147,600	118,600	100,000
Delaware	8,259	7,992	7,555	7,631	8,720	8,870	6,700	6,550
Maryland	37,291	37,203	34,174	34,705	40,699	41,600	30,500	28,500
NORTHEAST	**419,710**	**409,791**	**365,175**	**356,036**	**402,227**	**413,100**	**329,000**	**267,100**
Ohio	204,681	199,694	194,962	188,580	205,972	205,800	161,000	164,800
Indiana	186,853	181,086	174,055	167,382	183,002	182,600	149,000	146,400
Illinois	290,002	287,480	275,203	272,093	285,773	288,300	210,000	188,600
Iowa	327,863	329,172	318,998	317,052	328,292	329,300	235,000	223,300
Missouri	191,512	198,095	201,513	189,672	205,572	203,800	135,000	152,200
CORN BELT	**1,200,911**	**1,195,527**	**1,164,731**	**1,134,779**	**1,208,611**	**1,209,800**	**890,000**	**875,300**
Michigan	169,782	169,920	152,741	143,569	157,697	156,200	139,000	133,700
Wisconsin	234,387	247,427	229,752	237,457	258,119	264,800	171,000	170,300
Minnesota	275,833	284,887	258,614	260,535	282,533	287,500	210,000	189,300
LAKE STATES	**680,002**	**702,234**	**641,107**	**641,561**	**698,349**	**708,500**	**520,000**	**493,300**
North Dakota	121,039	122,056	118,069	123,072	121,966	123,500	84,000	70,800
South Dakota	115,639	120,100	111,532	114,456	112,782	112,900	84,000	71,100
Nebraska	175,254	180,423	166,098	170,423	177,691	181,900	108,000	98,700
Kansas	173,651	174,185	163,180	161,276	160,479	161,500	123,000	99,500
GREAT PLAINS	**585,764**	**596,764**	**558,879**	**569,317**	**572,918**	**579,800**	**399,000**	**340,100**
West Virginia	21,995	23,926	23,842	23,265	27,951	28,700	15,400	18,700
Kentucky	103,415	118,404	137,105	129,069	164,862	163,400	71,000	105,500
Tennessee	97,800	108,319	137,105	129,069	164,862	163,400	71,000	105,500
Virginia	75,143	78,989	79,347	76,121	90,284	89,900	52,000	63,200
North Carolina	140,639	149,850	150,825	130,140	152,917	145,000	57,600	73,400
APPALACHIAN	**438,992**	**479,488**	**513,647**	**469,536**	**566,045**	**553,200**	**239,000**	**327,100**
South Carolina	48,637	50,931	50,115	45,321	53,627	52,100	9,200	13,600
Georgia	89,392	89,049	84,366	77,067	85,049	82,900	23,500	34,000
Florida	35,820	41,295	42,958	44,192	57,226	60,000	12,300	20,500
Alabama	67,559	71,925	75,069	68,521	75,398	73,600	20,500	25,600
SOUTHEAST	**241,408**	**253,200**	**252,508**	**235,101**	**271,300**	**268,600**	**65,500**	**93,700**
Mississippi	84,425	90,347	88,677	76,808	80,964	77,000	29,700	32,400
Louisiana	53,229	60,618	63,194	55,933	64,337	62,400	15,400	22,500
Arkansas	83,852	90,993	86,977	78,083	89,421	87,300	41,900	50,100
DELTA STATES	**221,506**	**241,958**	**238,848**	**210,824**	**234,722**	**226,700**	**87,000**	**105,000**
Oklahoma	102,323	101,605	102,397	91,661	105,795	102,300	74,000	82,500
Texas	268,233	269,519	282,088	251,687	280,102	270,100	74,500	89,600
SOUTHERN PLAINS	**370,556**	**371,124**	**384,485**	**343,348**	**385,897**	**372,400**	**148,500**	**172,100**
Montana	59,510	61,832	58,729	58,457	55,941	59,400	30,500	28,500
Idaho	56,961	58,607	54,091	55,419	55,392	60,900	40,000	38,200
Wyoming	20,737	21,596	20,925	20,801	19,756	20,300	15,400	14,700
Colorado	64,051	63,906	59,112	58,091	59,959	62,300	34,000	28,800
New Mexico	17,146	17,919	15,998	17,021	17,546	18,350	11,300	8,800
Arizona	13,443	13,747	12,136	13,812	12,749	13,900	4,200	3,400
Utah	21,803	22,256	20,128	21,110	22,206	23,700	17,500	15,600
Nevada	5,297	5,557	5,318	5,515	5,453	5,950	3,100	2,700
MOUNTAIN STATES	**258,948**	**265,420**	**246,437**	**250,226**	**249,002**	**264,800**	**156,000**	**140,700**
Washington	63,114	65,813	58,600	59,542	58,190	68,700	42,000	41,300
Oregon	56,732	58,741	51,223	52,651	52,283	60,100	44,000	38,200
California	147,390	142,812	138,914	140,393	136,256	166,300	70,000	68,100
PACIFIC	**267,236**	**267,366**	**248,737**	**252,586**	**246,729**	**295,100**	**156,000**	**147,600**
TOTAL	**4,684,852**	**4,782,872**	**4,614,554**	**4,463,314**	**4,835,800**	**4,892,900**	**2,990,000**	**2,962,000**

[1] Only wheel tractors are included in the 1978 Census.

Principal Machines on Farms — 1981

STATE	COMBINES[1]					CORN HEADS FOR COMBINES[2]			
	1964 Census Number	1969 Census Number	1974 Census Number	1978 Census Number	Estimated July 1, 1981 Number	1969 Census Number	1974 Census Number	1978 Census Number	Estimated July 1, 1981 Number
Maine	875	218	242	415	435	120	141	192	200
New Hampshire	27	8	5	18	15	65	55	64	60
Vermont	344	113	87	170	160	175	238	375	400
Massachusetts	70	34	35	47	50	84	103	113	120
Rhode Island	20	5	7	15	15	21	10	23	20
Connecticut	77	40	15	86	75	92	85	157	160
New York	16,536	4,902	5,114	5,994	6,100	1,706	2,344	3,576	3,900
New Jersey	1,726	634	766	1,226	1,270	269	324	671	700
Pennsylvania	23,939	6,777	7,297	9,851	10,100	1,924	2,636	4,443	4,800
Delaware	1,780	979	1,127	1,351	1,400	566	681	1,035	1,085
Maryland	5,237	2,604	2,740	3,610	3,700	1,555	1,954	2,799	3,000
NORTHEAST	**50,631**	**16,314**	**17,435**	**22,783**	**23,320**	**6,577**	**8,571**	**13,448**	**14,445**
Ohio	50,291	20,805	26,009	33,996	36,000	11,892	17,515	24,522	27,100
Indiana	46,395	23,871	29,485	37,695	40,700	17,920	24,616	32,737	35,900
Illinois	80,857	48,116	55,085	63,650	67,800	37,649	46,362	56,213	60,200
Iowa	86,178	28,221	42,117	55,889	63,000	22,302	37,864	53,427	60,400
Missouri	44,535	24,208	26,253	34,029	35,200	16,112	18,278	23,544	24,600
CORN BELT	**308,256**	**145,221**	**178,949**	**225,259**	**242,700**	**105,875**	**144,635**	**190,443**	**208,200**
Michigan	41,360	13,053	14,649	19,474	20,300	4,306	7,098	11,333	12,700
Wisconsin	45,516	10,859	13,392	18,553	19,800	3,566	5,147	8,589	9,400
Minnesota	71,748	27,189	35,033	45,225	49,300	12,102	18,780	27,390	30,500
LAKE STATES	**158,624**	**51,101**	**63,074**	**83,252**	**89,400**	**19,974**	**31,025**	**47,312**	**52,600**
North Dakota	41,782	26,952	27,273	31,112	31,300	753	864	1,619	1,670
South Dakota	28,289	11,926	13,941	16,587	17,600	3,483	5,386	7,759	8,800
Nebraska	43,205	25,730	29,224	35,147	37,000	13,370	18,578	24,687	27,200
Kansas	59,813	41,601	41,871	47,650	47,800	6,533	8,038	9,282	10,000
GREAT PLAINS	**173,089**	**107,209**	**112,309**	**130,496**	**133,700**	**24,139**	**32,866**	**43,347**	**47,670**
West Virginia	1,020	245	307	479	500	147	199	265	300
Kentucky	9,737	4,565	6,329	10,760	11,700	3,196	4,390	8,510	9,100
Tennessee	11,537	5,773	6,843	10,952	11,500	2,458	2,734	5,634	5,800
Virginia	9,281	3,769	4,309	6,150	6,300	2,243	2,972	4,487	4,800
North Carolina	14,847	7,982	8,828	13,535	14,000	5,279	6,696	10,671	11,500
APPALACHIAN	**46,422**	**22,334**	**26,616**	**41,876**	**44,000**	**13,323**	**16,991**	**29,567**	**31,500**
South Carolina	7,085	4,483	4,706	6,609	6,700	1,803	2,285	3,931	4,100
Georgia	9,177	5,408	6,255	9,924	10,600	4,036	4,836	7,637	8,000
Florida	1,230	1,010	1,182	1,792	1,950	584	773	1,207	1,250
Alabama	4,806	3,423	3,988	6,958	7,400	1,635	1,858	3,468	3,600
SOUTHEAST	**22,298**	**14,324**	**16,131**	**25,283**	**26,650**	**8,058**	**9,752**	**16,243**	**16,950**
Mississippi	6,099	6,977	6,893	10,190	10,200	441	310	593	600
Louisiana	5,145	6,414	7,034	9,715	10,100	357	231	403	350
Arkansas	13,086	12,657	11,484	14,095	13,700	294	725	292	300
DELTA STATES	**24,330**	**26,048**	**25,411**	**34,000**	**34,000**	**1,092**	**1,266**	**1,288**	**1,250**
Oklahoma	21,668	14,909	14,797	18,006	18,000	457	511	900	930
Texas	31,355	21,223	19,394	23,742	22,800	1,743	1,858	3,684	3,770
SOUTHERN PLAINS	**53,023**	**36,132**	**34,191**	**41,748**	**40,800**	**2,200**	**2,369**	**4,584**	**4,700**
Montana	16,011	11,687	11,392	13,225	13,100	121	107	101	90
Idaho	11,330	7,639	8,113	10,180	10,500	202	252	458	470
Wyoming	2,962	1,523	1,690	2,017	2,100	112	149	180	200
Colorado	11,062	6,937	7,338	8,488	8,800	1,032	1,632	2,397	2,650
New Mexico	1,898	1,041	1,229	1,541	1,650	52	117	246	270
Arizona	559	412	530	513	550	25	23	70	70
Utah	2,421	1,442	1,442	1,748	1,800	134	196	186	200
Nevada	277	201	253	269	280	9	21	3	5
MOUNTAIN STATES	**46,520**	**30,882**	**31,987**	**37,981**	**38,780**	**1,687**	**2,497**	**3,641**	**3,955**
Washington	9,706	6,891	7,330	8,471	8,700	307	269	490	480
Oregon	8,372	5,107	5,266	6,442	6,550	167	106	185	150
California	8,366	5,619	5,373	6,492	6,400	633	696	1,085	1,100
PACIFIC	**26,444**	**17,617**	**17,969**	**21,405**	**21,650**	**1,107**	**1,071**	**1,760**	**1,730**
TOTAL	**909,637**	**467,182**	**524,072**	**664,083**	**695,000**	**184,032**	**251,043**	**351,633**	**383,000**

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[1] The Census in 1964 included self-propelled and pull types. The Census in 1969, 1974, 1978 and the estimated number for July 1, 1981 cover only self-propelled combines.

[2] The Census in 1969 included only corn heads on class 1-5 farms ($2,500 or more of income). The Census in 1974, 1978 and the estimated number for July 1, 1981 cover all farms.

Principal Machines on Farms – 1981

STATE	PICK-UP BALERS					FIELD FORAGE HARVESTERS[1]				
	1964 Census Number	1969 Census Number	1974 Census Number	1978 Census Number	Estimated July 1, 1981 Number	1964 Census Number	1969 Census Number	1974 Census Number	1978 Census Number	Estimated July 1, 1981 Number
Maine	3,339	2,446	2,255	2,770	2,670	998	712	914	1,341	2,100
New Hampshire	1,681	1,266	1,197	1,448	1,420	747	385	612	553	700
Vermont	5,796	4,171	3,975	4,434	4,330	2,358	1,542	2,328	2,798	3,750
Massachusetts	2,343	1,774	1,600	1,900	1,800	1,412	744	923	1,185	1,600
Rhode Island	250	171	172	209	210	233	88	122	138	170
Connecticut	1,971	1,604	1,313	1,715	1,520	1,561	788	777	831	1,000
New York	38,107	31,074	27,495	30,762	29,000	20,710	13,815	17,363	20,891	27,300
New Jersey	3,073	2,357	2,066	2,458	2,250	2,181	1,171	1,127	1,255	1,470
Pennsylvania	41,873	35,571	32,195	38,745	37,200	20,794	12,240	15,485	19,187	27,900
Delaware	664	609	628	618	600	475	245	422	282	400
Maryland	6,845	5,750	5,159	6,083	5,800	3,961	2,177	2,603	2,943	4,350
NORTHEAST	**105,942**	**86,793**	**78,055**	**91,142**	**86,800**	**55,430**	**33,907**	**42,676**	**51,404**	**70,740**
Ohio	43,607	40,101	36,137	39,170	37,200	11,759	7,788	9,757	11,419	16,900
Indiana	25,459	23,414	21,705	24,655	23,800	7,523	5,344	6,121	6,912	9,800
Illinois	38,163	33,291	29,822	31,487	29,700	16,295	10,130	11,333	11,905	15,500
Iowa	60,111	55,456	47,461	47,729	43,700	20,937	14,245	17,179	19,479	26,500
Missouri	36,265	38,929	38,487	44,886	44,500	9,315	6,884	7,430	8,786	9,800
CORN BELT	**203,605**	**191,191**	**173,612**	**187,927**	**178,900**	**65,829**	**44,391**	**51,820**	**58,501**	**78,500**
Michigan	31,502	26,915	23,897	26,039	24,500	15,077	8,986	11,682	12,986	17,100
Wisconsin	63,921	56,939	54,962	59,847	58,800	48,149	27,199	38,341	43,574	60,500
Minnesota	55,896	51,600	46,689	50,534	48,000	26,024	17,761	20,825	23,437	29,600
LAKE STATES	**151,319**	**135,454**	**125,548**	**136,420**	**131,300**	**89,250**	**53,946**	**70,848**	**79,997**	**107,200**
North Dakota	15,823	15,623	14,831	15,380	15,000	9,555	6,614	5,911	5,539	5,700
South Dakota	14,441	14,657	13,835	14,258	13,800	10,810	9,755	11,254	11,364	12,000
Nebraska	19,907	18,988	17,309	17,160	16,200	13,268	11,232	12,632	13,935	15,900
Kansas	28,086	27,464	26,846	29,550	29,100	17,035	11,712	10,651	10,844	11,600
GREAT PLAINS	**78,257**	**76,732**	**72,821**	**76,348**	**74,100**	**50,668**	**39,313**	**40,448**	**41,682**	**45,200**
West Virginia	7,362	8,013	7,444	10,051	9,700	1,155	1,143	1,478	2,134	2,700
Kentucky	21,476	24,121	23,536	32,538	32,100	3,157	3,621	4,400	8,269	9,650
Tennessee	15,234	17,686	17,090	22,597	22,300	3,002	2,953	3,602	5,579	6,700
Virginia	16,105	16,035	15,285	19,222	18,800	4,450	4,181	4,675	6,343	7,350
North Carolina	10,322	10,053	10,115	12,591	12,500	3,365	2,695	3,841	4,317	5,100
APPALACHIAN	**70,499**	**75,903**	**73,470**	**96,939**	**95,400**	**15,129**	**14,593**	**17,996**	**26,642**	**31,500**
South Carolina	4,468	3,857	3,719	4,763	4,700	1,139	887	1,075	1,381	1,750
Georgia	6,917	7,118	6,678	8,909	8,700	1,696	1,455	1,722	2,652	3,400
Florida	1,419	1,692	1,910	2,885	2,800	543	447	629	916	1,400
Alabama	6,231	7,227	7,662	10,393	10,500	1,233	1,250	1,513	2,158	2,700
SOUTHEAST	**19,035**	**19,894**	**19,969**	**26,950**	**26,700**	**4,611**	**4,039**	**4,939**	**7,107**	**9,250**
Mississippi	6,618	7,045	7,431	8,752	8,800	1,697	1,531	2,130	2,168	2,550
Louisiana	5,064	4,831	4,594	6,192	6,000	775	763	872	1,872	2,670
Arkansas	6,456	7,500	8,040	11,022	10,900	1,181	1,014	1,047	1,882	2,200
DELTA STATES	**18,138**	**19,376**	**20,065**	**25,966**	**25,700**	**3,653**	**3,308**	**4,049**	**5,922**	**7,420**
Oklahoma	12,965	14,246	14,432	20,032	20,000	2,820	1,872	1,740	2,420	2,800
Texas	15,737	18,208	18,534	28,338	28,500	4,643	3,556	3,215	5,451	6,300
SOUTHERN PLAINS	**28,702**	**32,454**	**32,966**	**48,370**	**48,500**	**7,463**	**5,428**	**4,955**	**7,871**	**9,100**
Montana	11,458	11,059	10,613	11,857	11,500	1,736	1,695	1,512	2,130	2,450
Idaho	13,072	12,057	12,048	13,043	13,000	2,696	1,907	2,048	2,435	2,950
Wyoming	4,259	4,357	4,383	4,572	4,500	1,086	924	995	1,267	1,550
Colorado	9,600	9,504	9,505	10,564	10,600	5,252	3,744	3,755	4,418	5,200
New Mexico	2,340	2,532	2,833	3,427	3,500	560	490	591	786	1,000
Arizona	1,001	860	1,018	1,081	1,100	556	281	314	341	520
Utah	6,389	5,887	5,957	7,171	7,100	1,989	1,378	1,560	1,909	2,300
Nevada	1,264	1,177	1,299	1,524	1,550	291	189	233	367	520
MOUNTAIN STATES	**49,383**	**47,433**	**47,656**	**53,239**	**52,850**	**14,166**	**10,608**	**11,008**	**13,653**	**16,490**
Washington	9,759	8,658	8,215	9,327	9,150	3,734	1,837	2,234	3,019	5,300
Oregon	8,007	7,218	7,195	9,207	9,100	2,419	1,532	1,496	2,718	3,800
California	8,389	6,829	6,435	6,832	6,500	3,189	1,666	2,006	2,628	4,500
PACIFIC	**26,155**	**22,705**	**21,845**	**25,366**	**24,750**	**9,342**	**5,035**	**5,736**	**8,365**	**13,600**
TOTAL	**751,035**	**707,940**	**666,007**	**768,727**	**745,000**	**315,541**	**214,568**	**254,475**	**301,144**	**389,000**

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[1] The Census in 1964 and the estimated number for July 1, 1981 include shear-bar and flail types. The Census in 1969, 1974 and 1978 covered only the number of shear-bar harvesters.

Principal Machines on Farms – 1981

STATE	POWER TRACTOR MOWERS (Cutter bar type only) Estimated July 1,1958 Number	Estimated July 1, 1981 Number	SIDE DELIVERY RAKES Estimated July 1, 1958 Number	Estimated July 1, 1981 Number	MOWER CONDITIONERS[1] 1974 Census Number	1978 Census Number	Estimated July 1, 1981 Number
Maine	9,000	7,570	10,000	6,520	1,378	2,092	2,440
New Hampshire	4,400	3,450	5,000	2,770	605	1,029	1,170
Vermont	10,000	10,100	10,300	8,140	2,776	4,104	5,000
Massachusetts	5,800	4,500	6,000	3,900	1,048	1,568	1,800
Rhode Island	550	400	500	350	102	144	160
Connecticut	4,500	3,960	4,000	2,760	786	1,234	1,480
New York	55,000	62,700	61,000	51,400	18,701	26,674	32,200
New Jersey	7,000	5,100	8,000	4,430	1,636	2,518	2,560
Pennsylvania	60,000	69,600	67,000	54,400	20,428	30,551	34,300
Delaware	1,750	1,230	2,200	1,130	525	603	830
Maryland	14,000	12,840	13,000	10,000	3,614	4,944	5,600
NORTHEAST	**172,000**	**181,450**	**187,000**	**145,800**	**51,599**	**75,461**	**87,540**
Ohio	70,000	74,000	86,000	63,100	20,268	28,007	32,800
Indiana	64,000	58,200	71,000	46,400	12,503	16,162	20,100
Illinois	106,000	81,200	86,000	60,400	18,793	21,817	28,500
Iowa	115,000	120,600	127,000	101,200	19,636	26,631	33,300
Missouri	80,000	96,800	50,000	59,200	17,228	24,047	30,700
CORN BELT	**435,000**	**430,800**	**420,000**	**330,300**	**88,428**	**116,664**	**145,400**
Michigan	48,000	55,600	85,000	48,700	15,924	22,066	25,200
Wisconsin	93,000	119,400	115,000	101,600	36,232	52,723	64,200
Minnesota	96,000	110,900	108,000	98,500	22,979	32,101	37,000
LAKE STATES	**237,000**	**285,900**	**308,000**	**248,800**	**75,135**	**106,890**	**126,400**
North Dakota	42,000	46,300	26,000	26,000	5,971	6,395	8,300
South Dakota	44,000	53,700	31,000	26,200	4,445	5,715	6,100
Nebraska	61,000	64,900	41,000	40,400	9,225	15,128	14,800
Kansas	62,000	63,400	42,000	41,800	9,247	17,520	16,300
GREAT PLAINS	**209,000**	**228,300**	**140,000**	**134,400**	**28,888**	**44,758**	**45,500**
West Virginia	14,000	21,200	8,000	11,000	3,484	5,401	5,600
Kentucky	48,000	57,300	28,000	35,900	14,718	24,497	24,800
Tennessee	47,000	61,600	25,500	28,300	12,037	17,526	19,700
Virginia	28,000	37,900	25,500	27,700	8,714	13,099	14,800
North Carolina	27,000	37,000	15,000	18,300	6,824	10,767	10,900
APPALACHIAN	**164,000**	**215,000**	**102,000**	**121,200**	**45,777**	**71,290**	**75,800**
South Carolina	12,500	11,900	7,500	6,950	2,471	3,612	4,000
Georgia	23,000	22,200	12,000	12,300	6,383	9,451	9,800
Florida	7,500	4,450	2,200	2,240	4,000	7,114	5,900
Alabama	19,000	20,200	7,300	8,810	5,367	8,834	8,400
SOUTHEAST	**62,000**	**58,750**	**29,000**	**30,300**	**18,221**	**29,011**	**28,100**
Mississippi	21,000	25,900	5,000	11,500	5,282	8,041	8,200
Louisiana	12,000	13,100	6,000	7,220	4,421	7,396	6,400
Arkansas	24,000	24,900	12,000	12,200	5,521	8,653	9,900
DELTA STATES	**57,000**	**63,900**	**23,000**	**30,920**	**15,224**	**24,090**	**24,500**
Oklahoma	37,000	38,100	22,000	23,000	7,703	15,717	14,000
Texas	48,000	55,600	21,000	26,500	19,487	34,266	32,700
SOUTHERN PLAINS	**85,000**	**93,700**	**43,000**	**49,500**	**27,190**	**49,983**	**46,700**
Montana	23,000	25,500	15,000	16,100	3,205	7,513	4,750
Idaho	27,000	25,100	23,000	19,200	3,367	9,282	5,090
Wyoming	10,500	7,180	6,000	6,050	1,179	3,530	1,900
Colorado	24,000	18,900	25,000	17,200	2,712	7,449	4,280
New Mexico	8,000	5,560	8,000	4,930	1,005	2,451	1,460
Arizona	4,500	2,380	3,700	1,640	427	841	590
Utah	11,700	13,220	12,000	10,900	2,257	5,292	3,970
Nevada	2,300	1,860	2,300	1,760	384	1,286	530
MOUNTAIN STATES	**111,000**	**99,700**	**95,000**	**77,780**	**14,536**	**37,644**	**22,570**
Washington	27,000	25,400	16,000	15,700	4,218	8,536	6,480
Oregon	23,000	23,700	15,000	13,900	3,634	7,487	6,120
California	33,000	28,400	22,000	16,400	3,590	8,129	4,890
PACIFIC	**83,000**	**77,500**	**53,000**	**46,000**	**11,442**	**24,152**	**17,490**
TOTAL	**1,615,000**	**1,735,000**	**1,400,000**	**1,215,000**	**376,440**	**579,943**	**620,000**

[1] Does not include windrowers with conditioning rolls.

Principal Machines on Farms – 1981

STATE	POWER ELEVATORS Estimated July 1,1951 Number	POWER ELEVATORS Estimated July 1, 1958 Number	POWER ELEVATORS Estimated July 1, 1981 Number	Manure Spreaders Estimated July 1, 1981 Number	Corn and Cotton Planters Estimated July 1, 1981 Number	Grain Drills Estimated July 1, 1981 Number
Maine	1,200	12,000	5,380	3,570	365	945
New Hampshire			2,520	2,210	320	70
Vermont			8,100	7,000	1,770	365
Massachusetts			3,650	2,620	980	130
Rhode Island			520	310	115	35
Connecticut			4,240	2,630	1,140	95
New York	7,200	35,000	70,500	44,700	21,900	29,600
New Jersey	2,000	5,500	6,220	2,760	2,660	2,700
Pennsylvania	9,600	38,000	75,000	47,000	36,900	44,800
Delaware	500	2,000	3,970	1,980	2,350	2,230
Maryland	2,500	7,500	16,500	9,570	9,540	9,900
NORTHEAST	**23,000**	**100,000**	**196,600**	**124,350**	**78,040**	**90,870**
Ohio	27,000	68,000	128,500	64,100	70,900	70,600
Indiana	30,000	66,000	127,600	57,300	72,600	57,400
Illinois	61,000	110,000	194,600	83,800	105,700	72,100
Iowa	80,000	122,000	204,200	113,600	117,800	67,400
Missouri	15,000	41,000	90,900	65,000	56,000	58,200
CORN BELT	**213,000**	**407,000**	**745,800**	**383,800**	**423,000**	**325,700**
Michigan	14,000	45,000	91,200	41,900	42,900	57,000
Wisconsin	15,000	48,000	143,700	95,100	75,400	72,300
Minnesota	46,000	90,000	160,700	87,500	90,900	84,000
LAKE STATES	**75,000**	**183,000**	**395,600**	**224,500**	**209,200**	**213,300**
North Dakota	28,000	45,000	77,900	23,700	17,100	66,400
South Dakota	24,000	40,000	69,300	33,200	34,400	37,600
Nebraska	36,000	60,000	107,300	51,200	50,900	48,200
Kansas	25,000	55,000	114,500	43,000	25,000	79,000
GREAT PLAINS	**113,000**	**200,000**	**369,000**	**151,100**	**127,400**	**231,200**
West Virginia	500	3,000	6,880	9,600	5,880	4,120
Kentucky	2,500	10,000	26,600	32,000	43,400	12,800
Tennessee	1,000	6,500	16,300	23,500	58,600	16,000
Virginia	2,000	11,000	20,600	25,000	29,500	19,400
North Carolina	1,000	7,500	22,200	24,200	82,900	25,900
APPALACHIAN	**7,000**	**38,000**	**92,580**	**114,300**	**220,280**	**78,220**
South Carolina	300	2,000	5,040	4,570	34,900	13,400
Georgia	900	6,000	15,100	7,630	44,000	11,500
Florida	300	1,500	4,000	1,320	6,740	2,000
Alabama	500	4,500	12,330	5,170	48,000	8,100
SOUTHEAST	**2,000**	**14,000**	**36,470**	**18,690**	**133,640**	**35,000**
Mississippi	700	4,500	8,460	5,840	59,800	9,520
Louisiana	400	1,000	2,770	3,340	22,400	8,550
Arkansas	900	4,500	10,350	8,150	24,600	15,300
DELTA STATES	**2,000**	**10,000**	**21,580**	**17,330**	**106,800**	**33,370**
Oklahoma	6,000	12,000	27,600	10,500	10,500	37,000
Texas	9,000	23,000	43,800	19,800	62,900	57,600
SOUTHERN PLAINS	**15,000**	**35,000**	**71,400**	**30,300**	**73,400**	**94,600**
Montana	7,500	17,500	30,600	12,300	1.250	24,700
Idaho	3,100	13,300	26,800	15,500	3,030	18,200
Wyoming	700	2,500	5,490	5,380	1,110	4,820
Colorado	7,000	13,000	27,500	16,000	7,090	18,200
New Mexico	500	1,500	2,830	2,610	3,600	2,270
Arizona	100	700	1,980	1,100	2,210	1,670
Utah	700	5,000	11,030	8,490	1,940	6,400
Nevada	400	500	1,040	1,250	70	380
MOUNTAIN STATES	**20,000**	**54,000**	**107,270**	**62,630**	**20,300**	**76,640**
Washington	2,000	8,000	23,800	16,500	2,110	14,700
Oregon	3,000	8,000	19,200	14,400	1,310	13,800
California	4,000	13,000	25,700	17,100	10,520	10,600
PACIFIC	**9,000**	**29,000**	**68,700**	**48,000**	**13,940**	**39,100**
TOTAL	**479,000**	**1,070,000**	**2,105,000**	**1,175,000**	**1,406,000**	**1,218,000**

Principal Machines on Farms – 1981

	MOTOR TRUCKS								
STATE	1954 Adj. Cen. 1,000's[1]	1959 Census 1,000's	1964 Census 1,000's	1969 Census 1,000's	1974 Census 1,000's	1978 Census 1,000's	Estimated July 1, 1981 1,000's	Internal Combustion Engines[2] Estimated July 1, 1981 Number	Chain Saws Estimated July 1, 1981 Number
Maine	18.1	17.3	14.8	12.1	11.3	13.5	13.6	1,880	8,620
New Hampshire	8.3	6.8	5.6	4.0	3.7	4.4	4.4	1,750	2,875
Vermont	11.1	10.0	8.1	6.1	6.2	7.9	7.9	2,470	7,120
Massachusetts	14.3	12.3	10.6	8.4	7.7	9.9	10.0	2,530	5,220
Rhode Island	1.9	1.9	1.8	1.2	1.2	1.5	1.5	260	725
Connecticut	13.2	11.0	9.9	7.4	6.2	7.5	7.6	2,210	4,360
New York	70.5	66.5	62.9	53.6	53.6	61.2	61.6	29,200	57,200
New Jersey	24,4	20.9	17.3	14.3	12.9	16.5	16.7	3,250	6,890
Pennsylvania	71.0	71.4	69.5	57.3	55.5	66.3	66.8	28,700	50,000
Delaware	5.2	5.3	5.2	5.1	5.7	6.5	6.5	1,300	2,890
Maryland	22.0	21.2	21.3	19.5	21.3	25.5	25.7	6,350	14,000
NORTHEAST	**260.0**	**244.6**	**227.0**	**189.0**	**185.3**	**220.7**	**222.3**	**79,900**	**159,900**
Ohio	77.0	81.5	91.4	93.7	97.8	112.9	113.7	27,300	69,700
Indiana	77.4	88.2	99.0	100.1	103.9	120.2	121.0	28,200	75,200
Illinois	99.9	113.7	120.9	129.3	139.9	155.4	156.5	41,600	81,600
Iowa	84.3	99.8	106.7	121.4	137.1	148.0	149.0	44,200	64,900
Missouri	95.8	109.7	123.0	132.5	134.0	162.5	163.7	45,100	108,400
CORN BELT	**434.4**	**492.9**	**541.0**	**577.0**	**612.7**	**699.0**	**703.9**	**186,400**	**399,800**
Michigan	70.5	75.7	80.5	74.6	73.6	83.4	84.0	25,200	52,300
Wisconsin	87.0	90.6	97.0	89.0	92.3	100.9	101.6	46,800	106,100
Minnesota	90.0	103.4	112.5	116.9	130.1	147.4	148.5	65,000	75,700
LAKE STATES	**247.5**	**269.7**	**290.0**	**280.5**	**296.0**	**331.7**	**334.1**	**137,000**	**234,100**
North Dakota	66.8	75.5	81.6	91.2	101.3	109.2	109.9	48,100	4,940
South Dakota	47.7	52.3	56.5	57.8	65.1	66.9	67.4	32,500	3,790
Nebraska	72.0	83.4	93.1	96.4	108.5	120.5	121.3	43,500	16,070
Kansas	112.1	122.3	134.0	141.3	150.9	164.4	165.6	57,200	26,600
GREAT PLAINS	**298.6**	**333.5**	**365.2**	**386.7**	**425.8**	**461.0**	**464.2**	**181,300**	**51,400**
West Virginia	26.0	24.7	24.1	19.5	16.9	21.8	21.9	6,820	24,700
Kentucky	66.7	74.9	90.5	97.1	95.8	125.4	126.3	22,400	51,100
Tennessee	71.6	76.8	86.3	92.8	88.1	104.6	105.3	16,900	67,500
Virginia	57.5	58.0	59.2	55.9	55.5	70.1	70.6	16,400	56,000
North Carolina	84.5	91.1	101.1	99.3	93.5	113.5	114.3	21,600	100,300
APPALACHIAN	**306.3**	**325.5**	**361.2**	**364.6**	**349.8**	**435.4**	**438.4**	**84,120**	**299,600**
South Carolina	39.2	39.1	39.0	35.3	33.7	40.5	40.8	8,450	28,300
Georgia	76.2	72.8	76.6	70.9	69.2	79.8	80.3	17,500	39,000
Florida	36.6	36.4	40.6	37.8	40.1	54.1	54.4	16,900	8,900
Alabama	63.7	63.4	69.5	67.4	64.4	75.1	75.7	14,300	36,700
SOUTHEAST	**215.7**	**211.7**	**225.7**	**211.4**	**207.4**	**249.5**	**251.2**	**57,150**	**112,900**
Mississippi	76.2	71.5	75.1	66.4	60.5	65.5	66.0	13,900	43,400
Louisiana	47.3	47.2	51.3	44.7	41.6	50.4	50.8	15,600	23,800
Arkansas	76.2	73.2	80.6	71.4	69.5	88.0	88.5	18,700	36,400
DELTA STATES	**199.7**	**191.9**	**207.0**	**182.5**	**171.6**	**203.9**	**205.3**	**48,200**	**103,600**
Oklahoma	85.7	92.7	105.1	106.8	101.6	126.2	127.1	28,200	11,800
Texas	187.8	197.8	211.0	227.6	208.1	257.3	259.0	80,000	23,000
SOUTHERN PLAINS	**273.5**	**290.5**	**316.1**	**334.4**	**309.7**	**383.5**	**386.1**	**108,200**	**34,800**
Montana	48.5	52.8	58.2	58.3	61.9	68.9	69.4	25,300	14,070
Idaho	38.7	44.0	48.3	47.1	51.4	59.2	59.7	20,800	15,600
Wyoming	15.0	16.2	17.7	18.4	19.2	20.6	20.7	8,320	3,800
Colorado	48.5	51.7	55.9	55.5	56.9	66.4	66.9	26,300	7,170
New Mexico	21.3	20.3	23.4	18.8	20.0	26.4	26.7	10,000	3,590
Arizona	13.5	16.8	17.2	12.1	14.4	16.8	16.9	6,680	610
Utah	18.0	18.8	20.3	18.3	19.4	22.7	22.9	8,580	2,840
Nevada	3.9	4.5	4.5	5.0	5.4	6.5	6.5	1,950	720
MOUNTAIN STATES	**207.4**	**225.1**	**245.5**	**233.5**	**248.6**	**287.5**	**289.7**	**107,930**	**48,400**
Washington	55.4	60.2	64.2	56.7	57.1	71.4	71.9	21,800	27,000
Oregon	47.7	48.9	53.6	46.2	49.6	60.8	61.2	28,100	30,600
California	128.8	131.0	126.1	115.7	118.8	142.7	143.7	81,900	37,900
PACIFIC	**231.9**	**240.1**	**243.9**	**218.6**	**225.5**	**274.9**	**276.8**	**131,800**	**95,500**
TOTAL	**2,675.0**	**2,825.5**	**3,022.6**	**2,978.2**	**3,032.4**	**3,547.1**	**3,572.0**	**1,122,000**	**1,540,000**

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[1] Census numbers have been adjusted to bring them more in line with 1959 and later data based on the new definition of a farm.

[2] Includes engines used for stationary work such as irrigation, auxiliary engines on combines, balers, etc., and a small number of power units not elsewhere classified.

NEW AGRICULTURAL WHEEL TRACTOR IMPORTS, JAN.-JUNE, 1981

(Excludes garden tractors except as indicated in headings, footnotes.)
Number of units/Value in thousands of dollars

Nation of Origin	Under 20 HP*	20-29 HP*	30-39 HP*	40-79 HP*	80-99 HP*	100 HP and Over*	HP Not Specifically Provided*
Canada	2/$2	7/$10	40/$360	22/$385	64/$2,345	232/$10,522	1,062/$62,636
United Kingdom	.....	145/1,310	180/1,401	3,639/58,762	624/8,177	489/8,993	7/119
Belgium	.....	.....	.....	639/7,870	.....	.....	.....
West Germany	.....	1/2	.....	3,201/31,271	1,286/18,417	302/5,704	5/97
Italy	134/111	10/38	111/498	1,375/11,022	285/4,357	110/1,995	47/331
Romania	.....	93/151	256/646	1,557/5,364	.....	.....	.....
U.S.S.R.	.....	.....	3/12	104/335	.....	.....	.....
Japan	12,408/37,734	7,240/27,065	2,777/11,044	1,034/6,267	.....	84/286	96/317
Others	6/18	7/19	19/138	77/2,072	.....	13/760	5/105
Totals	**12,550/$37,865**	**7,503/$28,595**	**3,386/$14,099**	**11,648/$103,348**	**2,259/$33,296**	**1,230/$28,260**	**1,222/$63,605**

NEW AGRICULTURAL WHEEL TRACTOR IMPORTS, JAN.-DEC., 1980

(Excludes garden tractors except as indicated in headings, footnotes.)
Number of units/Value in thousands of dollars

Nation of Origin	Under 20 HP*	20-29 HP*	30-39 HP*	40-79 HP*	80-99 HP*	100 HP and Over*	HP Not Specifically Provided*
Canada	14/$47	12/$32	90/$626	244/$7,824	187/$6,096	755/$29,635	1,662/$89,530
United Kingdom	14/16	106/721	579/4,173	9,471/95,770	2,395/28,592	226/4,655	53/449
Belgium	7/56	12/89	.....	220/10,142	.....	2/7	.....
West Germany	10/12	4/8	94/2,080	7,420/80,459	3,650/52,874	967/27,059	4/89
Italy	33/72	31/108	211/787	2,011/13,807	55/868	189/2,884	156/1,568
Romania	.....	1,280/2,615	827/1,838	2,110/6,582	.....	.....	2/14
Poland	.....	.....	1/7	54/429	103/584	47/526	.....
U.S.S.R.	.....	1/2	.....	455/1,422	.....	.....	.....
Japan	16,917/42,213	15,897/54,470	7,622/35,193	2,120/15,661	5/36	2/31	80/469
Others	.....	53/254	11/499	102/1,567	1/13	3/180	3/48
Totals	**16,995/$42,415**	**17,396/$58,298**	**9,435/$45,202**	**24,757/$233,662**	**6,396/$89,063**	**2,211/$64,976**	**1,960/$92,167**

NEW AGRICULTURAL WHEEL TRACTOR IMPORTS, JAN.-DEC., 1979

(Excludes garden tractors except as indicated in headings, footnotes.)
Number of units/Value in thousands of dollars

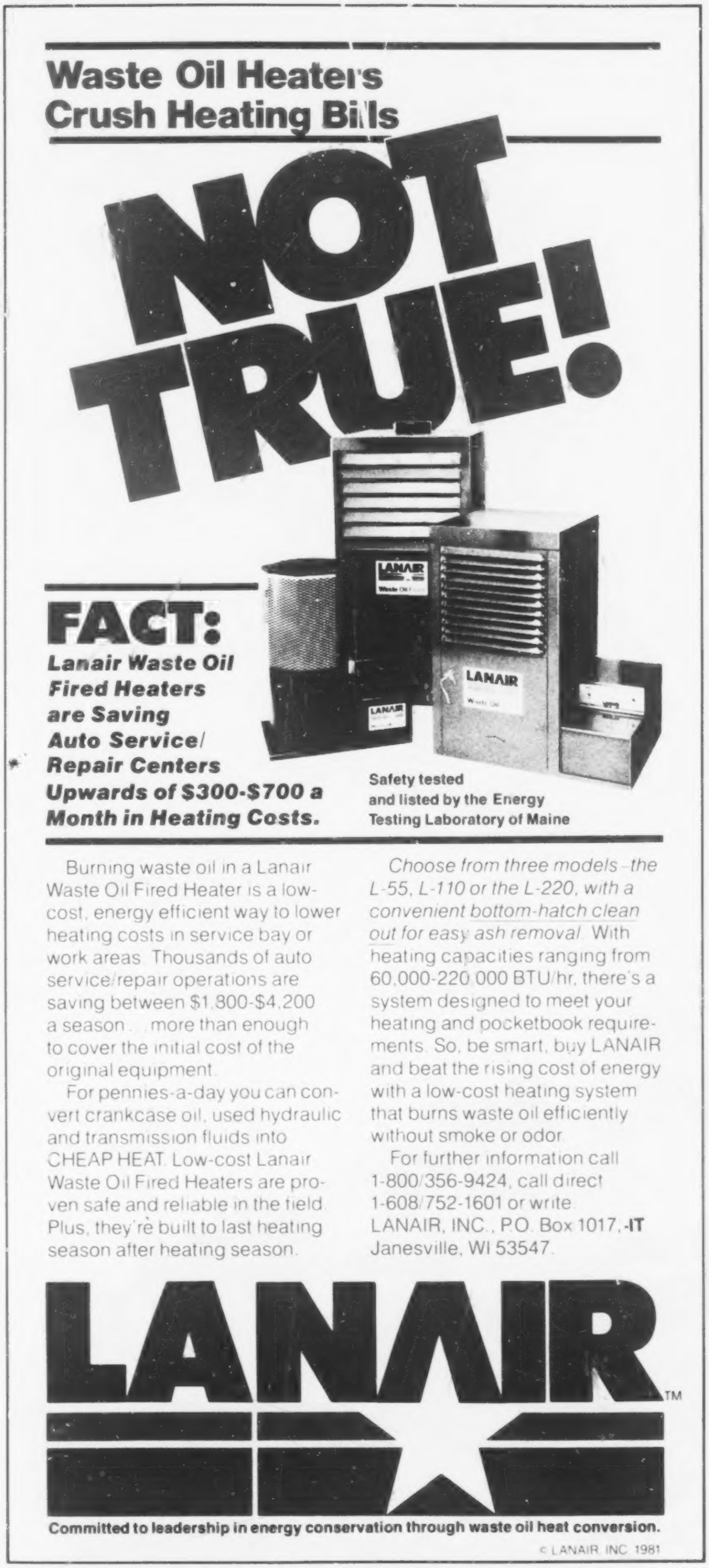
Nation of Origin	Under 20 HP*	20-29 HP*	30-39 HP*	40-79 HP*	80-99 HP*	100 HP and Over*	HP Not Specifically Provided*
Canada	21/$41	48/$96	144/$681	625/$11,979	345/$10,178	821/$29,358	1,579/$72,459
United Kingdom	19/132	242/1,310	330/1,820	7,997/66,026	3,611/26,386	24/195	92/667
Belgium	1/7	.....	10/69	87/827	1/19	1/69	12/155
France	.....	36/111	.....	34/1,731	2/63	.....	.....
West Germany	23/51	.....	25/178	9,125/82,337	2,416/30,017	1,281/21,059	320/3,884
Italy	234/1,649	519/1,866	103/382	1,033/8,734	219/2,500	14/325	26/230
Rumania	580/2,709	5/8	813/1,547	2,477/6,264	.....	2/22	8/80
Spain	.....	320/347	75/482	150/1,080	.....	.....	19/128
U.S.S.R.	.....	50/59	.....	158/544	.....	5/73	.....
Japan	17,480/44,088	26,856/89,370	16,435/57,383	2,876/21,635	6/59	350/760	526/1,434
Others	72/169	.....	2/18	39/342	.....	1/30	1/8
TOTALS	**18,430/$48,846**	**28,076/$93,189**	**17,937/$62,560**	**24,601/$201,499**	**6,600/$69,218**	**2,499/$51,891**	**2,583/$79,045**

Source: U.S. Dept. of Commerce, Industry & Trade Administration.
*Excluding garden tractors. **Including garden tractors. The term "industrial" here is understood to refer to such machines as fork-lifts, but not industrial tractors as defined in the farm and industrial equipment industry.

Not Elsewhere Specified, Excluding Industrial, Including Garden Types**	Totals	
100/$4,016	1,529/$80,366	..........Canada
82/834	5,166/59,596	...United Kingdom
.....	639/7,870	.........Belgium
2/22	4,797/55,513	....West Germany
109/1,614	2,171/19,966	.............Italy
.....	1,906/6,161	.........Romania
15/28	122/375	..........U.S.S.R.
3,294/4,958	26,933/87,671	...........Japan
2/63	129/3,175	...........Others
3,604/$11,535	**43,402/$320,603**	.........**Totals**

Not Elsewhere Specified, Excluding Industrial, Including Garden Types**	Totals	
194/$3,172	3,158/$136,967	..........Canada
94/209	12,938/134,585	...United Kingdom
.....	789/10,294	.........Belgium
207/3,606	12,379/166,187	....West Germany
571/5,890	3,070/25,984	.............Italy
33/153	4,252/11,202	.........Romania
1/66	206/1,612	..........Poland
28/33	485/1,457	..........U.S.S.R.
8,600/5,529	51,243/153,602	...........Japan
119/557	292/3,118	...........Others
9,847/$19,238	**88,997/$644,972**	.........**Totals**

Not Elsewhere Specified, Excluding Industrial, Including Garden Types**	Totals	
461/$8,224	4,044/$133,016	..........Canada
1,290/9,519	13,605/106,055	..United Kingdom
1/6	113/1,152	.........Belgium
2/42	74/1,947	..........France
587/9,058	13,777/146,584	...West Germany
871/6,467	3,019/22,155	............Italy
2/22	3,887/10,652	.........Rumania
31/288	595/2,325	...........Spain
158/577	371/1,253	........U.S.S.R.
4,534/5,144	69,063/219,893	..........Japan
105/326	220/893	..........Others
8,042/$39,673	**108,768/$645,925**	........**TOTALS**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DOLLAR VALUE OF FARM EQUIPMENT IMPORTS BY COUNTRY OF ORIGIN, Jan., 1977-June, 1981
(in thousands)

Country	Jan.-Dec. 1977	Jan.-Dec. 1978	Jan.-Dec. 1979	Jan.-Dec. 1980	Jan.-June 1981
Canada	$619,662	$506,728	$831,155	$820,500	$373,636
Mexico	8,363	6,277	10,082	9,080	5,229
Brazil	NA*	2,194	892	1,002	756
Sweden	2,077	1,708	4,818	4,456	1,716
Norway	1,751	1,075	1,273	1,239	1,001
Denmark	4,054	4,513	7,158	5,703	2,480
Netherlands	13,560	12,690	16,942	15,407	8,458
United Kingdom	110,071	125,241	209,967	215,932	93,539
Belgium	78,191	66,347	93,709	67,188	32,960
France	36,715	36,351	62,294	51,488	25,100
West Germany	118,861	141,392	231,521	236,578	105,228
Austria	1,219	783	1,188	1,195	531
Hungary	4,474	4,673	10,727	10,155	5,129
U.S.S.R.	1,415	1,113	2,715	1,716	533
Poland	3,705	1,746	1,346	3,334	948
Romania	10,451	8,372	11,648	11,611	6,622
Italy	50,246	75,066	78,523	94,794	58,067
Spain	4,326	3,768	9,239	5,559	1,788
Israel	940	1,545	2,616	3,218	1,333
New Zealand	2,525	1,918	5,312	6,665	4,854
Australia	3,642	3,218	5,937	4,366	3,733
Japan	73,861	167,858	267,599	189,753	107,879
China (Taiwan)	1,273	1,446	1,916	1,573	994
South Africa	3,830	3,972	6,332	5,234	1,461
Others	2,347	2,762	5,561	5,287	2,548
TOTAL	**$1,157,560**	**$1,182,758**	**$1,880,470**	**$1,773,033**	**$846,527**

SOURCE: U.S. Dept. of Commerce, Industry & Trade Administration.
*Data not available, included with "others."

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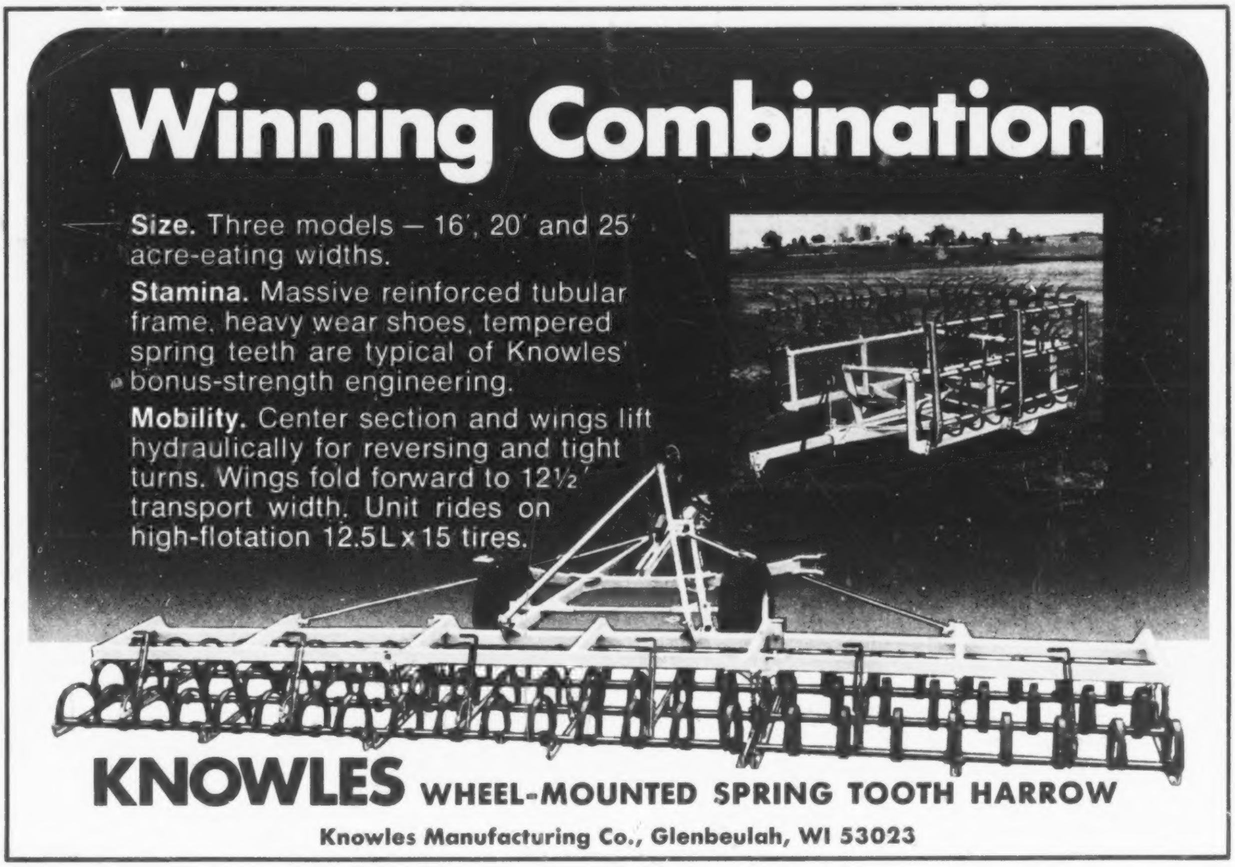
IMPORTS OF FARM EQUIPMENT BY PRODUCT

	Jan.-Dec., 1979		Jan.-Dec., 1980		Jan.-June, 1981	
Product	Quantity	Value in Thousands of Dollars	Quantity	Value in Thousands of Dollars	Quantity	Value in Thousands of Dollars
Knives & Cutting Blades	7,030,211	$ 4,926	10,326,000	$ 12,406	3,501,804	$ 4,843
Plows & Listers	20,971	11,620	9,351	13,297	1,873	4,460
Cultivators & Weeders	22,026	31,345	16,854	27,760	5,732	13,577
Parts of Plows, Cultivators, Weeders & Listers	.....	30,534	.....	27,516	.....	15,549
Harrows, Rollers, Stalk Cutters, Soil Pulverizers	29,416	8,322	23,030	10,102	13,932	6,342
Parts of Harrows, Rollers, Stalk Cutters, etc.	.....	15,538	.....	14,882	.....	6,637
Planting, Seeding & Fertilizing Machinery	32,080	43,253	31,476	55,647	18,558	28,666
Parts of Planting, Seeding & Fertilizing Machinery	.....	14,685	.....	12,957	.....	7,834
Haying Machinery other than Mowers	9,749	15,655	9,183	24,751	4,310	10,596
Mowers except Lawn Mowers	18,641	20,600	17,912	25,802	9,559	15,691
Harvesting Machines, NES	17,623	282,895	17,667	283,829	6,897	101,139
Parts of Harvesting Machines	.....	113,999	.....	95,307	.....	32,988
Farm Wagons & Carts	11,900	10,559	10,829	11,733	5,585	8,249
Agricultural Machines & Implements, NES	.....	102,254	.....	85,859	.....	47,909
Parts of Agricultural Machines, NES	.....	72,262	.....	67,386	.....	37,506
Tractors, Agricultural, Wheel-Type, New, excluding Industrial*	108,787	645,952	88,997	644,972	43,402	320,603
Tractors, Agri., Used	4,132	25,740	3,040	19,013	1,782	10,451
Parts for Agri. Tractors	.....	451,981	.....	335,542	.....	169,147

SOURCE: U.S. Dept. of Commerce, Bureau of Industrial Economics.
NEC—Not elsewhere specified.
*Use of the term "Industrial" here is understood to refer to such machines as forklifts but not to industrial tractors as commonly defined in the farm and industrial equipment industry.



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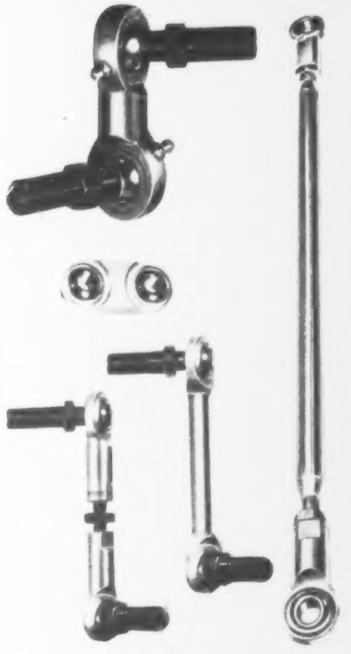

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VALUE OF U.S. FARM EQUIPMENT EXPORTS BY COUNTRIES OF DESTINATION

(Value in thousands of dollars)

Country	1979	1980	Jan.-June, 1981
Western Hemisphere			
Canada	$1,003,343	$1,068,234	$749,912
Mexico	204,046	350,572	129,042
Guatemala	10,625	7,020	3,884
Honduras	7,360	6,573	3,158
Nicaragua	1,296	18,116	4,363
Costa Rica	6,213	7,875	1,989
Panama	4,828	4,917	3,573
Trinidad	3,164	4,507	3,111
Dominican Republic	7,057	15,018	4,338
Colombia	11,413	17,290	7,957
Venezuela	51,861	68,581	35,742
Brazil	24,389	36,697	19,229
Uruguay	7,434	6,323	1,831
Paraguay	2,808	3,432	1,588
Argentina	20,756	41,687	23,621
Chile	8,211	12,425	7,132
Ecuador	9,696	13,017	8,897
Peru	7,456	14,793	5,864
Europe			
Denmark	8,694	11,852	4,723
Sweden	8,892	9,739	6,976
United Kingdom	66,786	66,143	45,242
Netherlands	11,459	11,494	4,926
Belgium	93,668	84,389	66,072
France	90,350	111,678	58,584
West Germany	67,403	78,472	31,059
Hungary	8,078	11,455	7,190
Switzerland	3,033	3,985	2,420
Spain	14,042	20,382	7,812
Italy	9,692	15,235	8,971
Greece	7,976	5,013	786
Yugoslavia	6,020	7,360	1,350
U.S.S.R.	10,383	10,276	15,186
Poland	3,692	2,516	75
Middle East			
Iran	2,350	2,673	227
Iraq	2,917	7,940	2,738
Israel	17,859	14,181	7,901
Kuwait	2,932	4,622	2,588
Saudi Arabia	19,731	28,564	20,404
Syria	2,150	2,673	1,215
Arab Emirates	1,409	2,536	3,243
Asia and Pacific			
India	3,397	3,865	1,355
Thailand	5,078	3,509	1,816
Singapore	18,343	24,790	9,940
China (PRC)	3,022	11,672	2,452
China (Taiwan)	1,953	2,769	1,149
Malaysia	2,823	3,158	1,347
Indonesia	2,360	4,015	1,253
Philippines	6,680	4,654	2,771
Japan	38,108	33,284	13,085
Australia	119,390	183,083	98,409
New Zealand	8,906	11,711	4,249
Africa			
Algeria	1,363	2,205	2,205
Libya	18,237	7,233	8,879
Sudan	3,243	5,974	5,667
Nigeria	2,763	8,534	3,388
Congo (Braz.)	10	4,413	430
Egypt	4,988	5,234	7,778
Ivory Coast	12,364	3,713	722
Rep. South Africa	21,452	47,928	54,553
Total U.S. Exports, Farm & Industrial Equipment	**$2,187,420**	**$2,631,287**	**$1,568,922**

Source: U.S. Dept. of Commerce, Transportation & Capital Equipment Div.

FARM EQUIPMENT EXPORTS BY TYPE OF PRODUCT

Product	Jan.-Dec., 1979 Quantity	Jan.-Dec., 1979 Dollar Value in Thousands	Jan.-Dec., 1980 Quantity	Jan.-Dec., 1980 Dollar Value in Thousands	Jan.-June, 1981 Quantity	Jan.-June, 1981 Dollar Value in Thousands
Combines, pull-type	2,460	36,467	2,238	45,807	1,159	22,170
Combines, self-propelled	6,680	143,364	7,085	205,525	3,554	137,479
Cultivators, tractor-drawn or mounted	5,523	12,373	7,753	13,342	6,056	10,890
Cultivators, NEC, and Weeders	6,074	6,478	4,628	5,193	2,060	2,840
Farm Elevators and Blowers	3,531	9,372	3,246	9,579	1,975	7,184
Farm Wagons and Carts	5,985	3,227	2,855	3,428	1,570	3,086
Parts for Farm Wagons and Carts	.....	2,646	.....	1,471	.....	1,384
Fertilizing Machines	47,442	24,510	29,463	20,890	4,856	11,827
Forage Harvesters	3,861	29,824	6,146	38,960	2,661	21,486
Harrows, Disk	11,505	26,781	7,484	23,762	6,316	15,196
Harrows, NEC, & Soil Pulverizers	11,972	11,693	9,530	9,997	5,963	6,752
Parts for Harrows, Stalk Cutters & Soil Pulverizers	.....	13,680	.....	10,231	.....	6,556
Harvesting Machines, NEC	11,021	91,541	12,860	116,973	6,311	62,922
Harvesting Machine Parts	.....	60,731	.....	83,228	.....	53,282
Hay Balers	10,525	42,816	15,643	75,316	10,444	60,932
Haying Machines, NEC (incl. rakes & tedders)	7,286	25,353	7,555	36,214	6,071	29,809
Parts for Haying Machines	.....	31,839	.....	27,802	.....	14,064
Mowers, Cutterbar, tractor-drawn	2,853	6,181	3,032	6,791	2,462	6,102
Mowers, Rotary, tractor-drawn (excl. lawn mowers)	9,277	6,391	10,884	9,309	5,130	3,806
Mowers, NEC, tractor-drawn (excl. lawn mowers)	2,720	7,588	3,150	9,032	2,243	7,252
Planting Machines	8,218	11,260	6,355	11,897	5,419	15,147
Plows, Disk	4,461	6,687	3,555	7,405	2,156	4,829
Plows, Moldboard	3,415	11,050	4,067	12,584	3,452	9,195
Plows & Listers, NEC	6,067	12,243	8,009	12,854	2,568	7,239
Parts for Plows, Listers, Cultivators & Weeders	.....	36,494	.....	31,325	.....	18,981
Seeding Machines	24,409	22,549	14,461	21,248	10,896	15,471
Parts for Planting, Seeding & Fertilizing Machines	.....	18,489	.....	19,312	.....	10,780
Farm Tractors:						
Under 40 PTO HP	4,471	21,940	3,871	18,026	988	6,155
40-59 PTO HP	2,605	23,038	1,401	13,895	909	10,100
60-79 PTO HP	1,733	20,809	1,533	20,000	938	13,526
80-99 PTO HP	1,608	25,139	1,395	24,638	1,280	22,867
100-119 PTO HP	4,182	79,125	3,685	79,841	2,484	59,431
120-139 PTO HP	6,142	127,612	7,039	168,898	3,806	100,663
140-159 PTO HP	2,598	61,816	2,546	69,351	1,322	39,906
160-179 PTO HP	1,241	37,109	1,437	51,786	1,041	38,820
180 HP & Over	2,801	101,755	3,153	128,483	2,021	91,021
Other Farm Tractors	4,034	53,607	2,972	54,124	1,364	28,382
Parts for Farm Tractors	.....	611,457	.....	773,515	.....	387,152

SOURCE: U.S. Dept. of Commerce, Bureau of Industrial Economics.
NEC – Not elsewhere counted or classified.

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Wheel Tractors, Attachments and Parts, Value of Shipments, 1976-1980

(in thousands of dollars)

	1980	1979	1978	1977	1976
Wheel Tractors, Farm Type	2,761,480	2,901,693	2,264,398	2,424,139	2,235,111
Wheel Tractors, Non-Farm	115,154	165,506	132,694	115,458	93,876
Attachments for Wheel Tractors, Farm and Non-Farm	48,066	69,353	36,527	34,780	37,472
Parts for Wheel Tractors, Farm and Non-Farm	469,505	255,726	263,312	420,273	279,637
Wheel Tractor Chassis, Shipped as Part of Shovel Loader/Backhoe	306,736	351,306	278,269	212,826	122,525
TOTALS	**3,700,941**	**3,743,584**	**2,975,200**	**3,207,476**	**2,768,621**

Source: U.S. Dept. of Commerce, Bureau of the Census, Current Industrial Reports, Tractors (M35S).

Farm Machinery and Garden Equipment, Attachments and Parts, Value of Shipments, 1975-1979

(in thousands of dollars)

	1979	1978	1977	1976	1975
Planting, Seeding and Fertilizing Machinery	675,388	522,416	550,782	516,847	480,273
Harrows, Rollers, Pulverizers, Stalk Cutters	603,784	462,419	465,974	478,322	476,274
Plows	269,616	203,617	239,151	266,660	250,134
Harvesting Machinery	2,143,938	1,815,631	1,599,722	1,435,307	1,253,430
Haying Machinery	675,610	533,738	469,715	508,250	481,334
Farm Dairy Machines and Equipment	132,865	108,920	97,347	77,087	68,037
Sprayers and Dusters	239,486	197,931	161,709	158,848	155,752
Farm Elevators and Blowers	174,728	157,168	114,691	87,611	100,404
Cultivators and Weeders	267,696	206,125	140,079	224,013	227,440
Machines for Preparing Crops for Market or Use	390,442	356,008	308,932	233,656	262,379
Farm Poultry Equipment	223,343	159,452	127,867	100,472	70,023
Hog Equipment	117,518	95,226	54,481	59,793	37,574
Other Barn and Barnyard Equipment	309,000	251,587	188,150	160,580	137,250
Garden Tractors, Motor Tillers	NA	686,375	574,702	586,278	553,269
Farm Wagons, Other Farm Transportation Equipment[1]	277,227	247,779	183,934	173,130	178,577
Irrigation Systems	214,627	161,348	279,272	290,071	180,406
Commercial Turf, Mowing Equipment	136,088	NA	107,400*	NA	NA
Other Turf, Grounds Care Equipment	36,064	NA	172,900*	NA	NA
Consumer Nonriding Lawn, Garden, Snow Equipment	1,284,875	NA	844,400*	NA	NA
Consumer Riding Lawn, Garden, Snow Equipment	1,030,606	NA	776,700*	NA	NA
TOTALS	**8,833,388**	**5,479,495**	**6,773,261**	**5,356,925**	**4,912,556**

[1] Data for 1976, 1977 and 1978 include operator cabs in attachments and parts for these items.
NA – Not available or not applicable.
*Data from 1977 Census of Manufacturers.
Source: U.S. Dept. of Commerce, Bureau of the Census, Current Industrial Reports, Farm Machinery and Lawn and Garden Equipment (MA-35A).

Shipments of Farm Machines and Equipment

(in units, 1975-1979)

Type of Farm Equipment	1979	1978	1977	1976	1975
Balers, hay (all types):					
Bales under 200 lbs.	20,867	22,659	24,876	26,054	27,718
Bales over 200 lbs.	31,443	21,323	17,745	24,097	21,400
Blowers (includes forage type, combination grain-forage type)	15,787	12,018	10,348	9,826	10,082
Cabs (metal), farm tractor	49,259	54,651	6,766	12,216	11,734
Cabs, other equipment	4,648	3,995	9,025		
Combines, grain, pull-type and self-propelled	32,400	32,020	31,943	31,712	31,259
Combines, peanut	2,105	1,974	1,790	1,919	2,647
Corn heads	20,052	18,629	24,035	25,087	26,741
Cotton strippers (all types)	1,279	1,900	1,816	1,127	1,361
Cultivators, corn and cotton types[1]	43,618	38,355	33,999	40,299	48,404
Cultivators, field:					
Pull-type	19,340	13,440	17,470	22,703	21,709
Mounted	4,693	5,262	8,992	9,239	8,469
Cultivators, rotary:					
Ground driven, sections and machines[2]	16,480	16,794	16,219	.....	.....
Ground driven, integrally mounted	11,466	12,214	8,637	12,034	17,136
Power driven	757	628	672	1,186	9,513
Cultivators and weeders, other	32,283	42,148	46,372	30,659	20,296
Cutters and shredders or rotary mowers (pto):					
Flail-type	12,747	9,521	12,409	12,096	11,359
Horizontal blade-type	95,045	72,469	79,953	74,562	76,412

See footnotes at end of table.

(More...)

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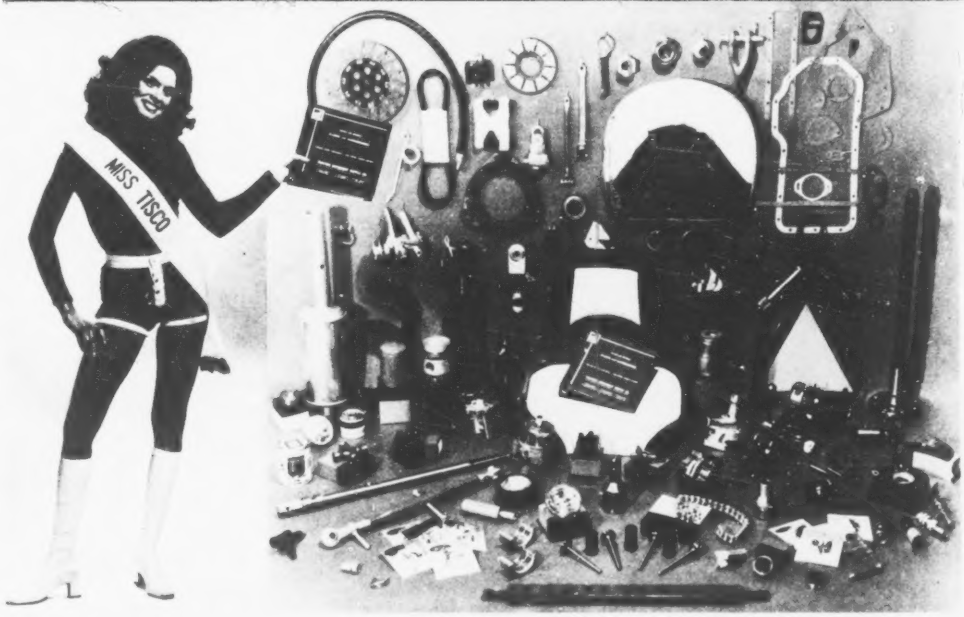

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Shipments *(continued)*

Type of Farm Equipment	1979	1978	1977	1976	1975
Diggers, peanut (shakers and windrowers but not combines)	1,847	2,002	2,517	1,706	2,207
Distributors (fertilizer):					
Dry	11,754	11,522	11,446	13,310	12,306
Liquid	7,196	6,503	6,619	5,635	4,997
Anhydrous Ammonia	7,178	6,455	6,562	8,458	5,233
Dryers, grain, hay and seed batch type, pto or electric-motor operated	9,809	9,355	10,373	6,525	6,268
Continuous flow-type	1,755	2,306	4,362	2,446	2,529
Heated air units	21,573	28,290	26,692	20,933	22,011
Dusters, power, all types	727	574	875	2,095	2,152
Elevators, portable:					
Single chain	8,224	7,211	5,004	5,625	7,196
Double chain	9,446	8,787	7,174	5,504	10,794
Auger-type, under 6-in. dia.	35,368	31,662	40,668	28,260	29,684
Auger-type, 6-in. dia.	56,318	79,401	73,628	53,425	55,207
Auger-type, over 6-in. dia.	66,491	81,664	58,382	51,232	50,016
Elevators, stationary and other	32,994	32,355	10,270	5,439	7,329
Fans, crop drying and aeration	51,441	59,912	45,668	24,997	19,586
Grain heads for combines	55,918	50,609	45,892	47,991	62,049
Grinder-mixers, stationary and portable	18,888	16,907	12,393	13,621	15,227
Harrows, disk	85,375	76,857	96,650	111,009	120,904
Harrow sections (spike-, spring-, and tine-tooth)	120,695	98,108	103,260	156,562	199,166

See footnotes at end of table.

(More...)

TECHNOHAC ® **A.M.T.I. Inc.**
Agricultural Machinery & Implements Co.

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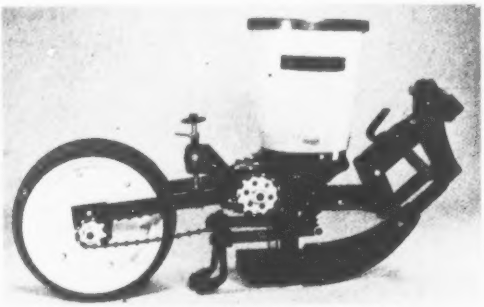
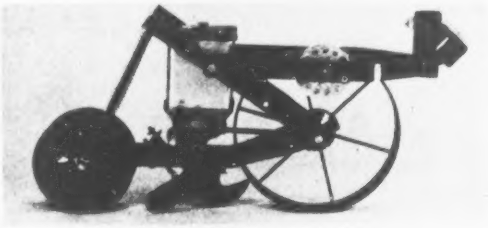
ASK US ABOUT OUR OTHER MECHANICAL SEEDERS — VEGETABLE & MULTI-PURPOSE PLANTER.



SINGLE SEEDING UNIT FOR COTTON, CORN, SORGHUM, SUNFLOWERS, SUGAR BEET AND MELONS.



SINGLE SEEDING UNIT T-10 FOR VEGETABLES AND SUGAR BEET. TRACTOR MOUNTED AND MANUAL VERSION SEEDER PLANTER.

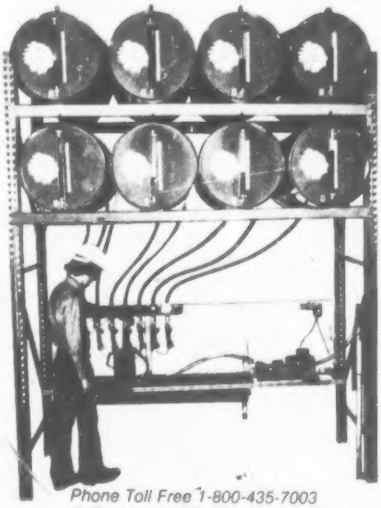
Circle (30) on Reply Card

Shipments *(continued)*

Type of Farm Equipment	1979	1978	1977	1976	1975
Plows, disk, 1-way, 2-way	168	184	278	317	357
Plows, chisel or sweep type:					
Pull-type	15,455	12,090	15,084	21,505	19,351
Mounted	9,703	10,501	15,194	16,694	16,547
Plows, terracing and ditching	2,308	2,039	2,261	2,938	2,536
Plows, moldboard:					
Pull-type, 1-way	3,873	2,666	4,438	6,988	5,833
Mounted, 1-way	13,224	11,852	15,771	16,513	17,565
Semi-mounted, 1-way	18,883	14,099	22,294	23,841	27,283
Pull-type and mounted, 2-way	3,577	3,473	3,822	5,369	5,978
Plows, subsoilers (deep tillage)	8,321	6,964	8,129	5,527	5,143
Plows, other (except snow)	2,610	2,891	1,795	1,646	1,248
Rakes, hay, side-delivery, cylinder and finger wheel types	19,121	20,602	20,328	21,896	22,591
Rollers and harrow mulchers	8,527	8,384	8,619	10,018	10,453
Sprayers, field and row crop type:					
Power, self-propelled	4,257	3,590	2,941	3,686	4,583
Power, tractor-mounted	27,185	22,368	17,228	15,340	19,539
Power, non-tractor-mounted	17,031	14,142	13,498	15,151	17,965
Sprayers, power, air-carried type (field, row crop, orchard):					
Complete units	9,856	8,019	7,662	7,740	8,694
Attachment type				84	153
Spreaders, manure:					
Conveyor type	16,586	16,528	16,688	18,065	19,996
Tank type	8,772	7,584	7,853	8,174	9,981
Stackers, hay	1,803	1,442	1,037	4,517	8,972

See footnotes at end of table.

(More...)



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SAUK VALLEY EQUIPMENT CO.
200 E. Third St. Rock Falls, IL 61071

Circle (35) on Reply Card

AS OF JUNE, 1981
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MANUFACTURERS
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YOU WIN, TOO.

Farm Equipment
Manufacturers Association
230 South Bemiston St. Louis, Missouri 63105

Circle (36) on Reply Card

People start
pollution.
People can stop it.

Shipments *(continued)*

Type of Farm Equipment	1979	1978	1977	1976	1975
Tool bars, basic units, pull or mounted	7,246	6,715	8,639	7,183	7,657
Tractors, track-laying type	19,812	22,057	19,968	18,972	20,453
Tractors, wheel-type:					
Farm type	159,973	136,240	168,888	175,977	187,117
Non-farm type	18,452	16,741	17,623	17,747	24,199
Transplanters, pull-type or mtd., and broadcast seeders	43,672	27,296	30,250	29,400	25,558
Wagons, farm type (chassis only) and trailer gear	53,247	53,257	57,831	59,336	93,570
Wagon boxes and racks for mounting on wagons and trailer gear:					
Manual unloading or dump	23,342	23,143	16,437	17,202	18,753
Gravity unloading (grain type)	39,377	31,072	28,714	32,470	41,350
Power unloading	19,950	18,599	19,135	20,825	22,480
Wagon boxes with integral running gear	8,136	7,206	6,097	6,107	7,407
Windrowers or swathers, grain harvesting, draper type	1,031	617	601	1,225	1,218
Windrowers, haying, self-propelled with conditioner	5,841	4,098	6,003	7,386	8,539

In some cases, I&T has combined data because of space limitations. If you need more information from MA-35A, write us.
DATA: Current Industrial Reports, Series MA-35A and M-35S, Bureau of the Census.
[1] Rear-mounted only; data for front-mounted machines are combined under Cultivators and Weeders, Other.
[2] Includes data for integrally mounted machines, under 4-row.
NA – Not available or not applicable.

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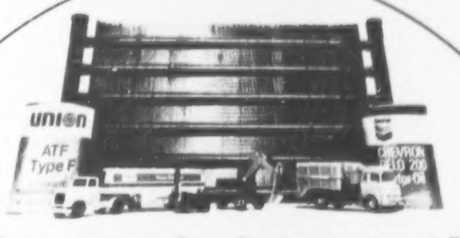

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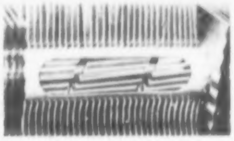

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Circle (37) on Reply Card

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November 21, 1981
TWO DOLLARS

Implement&Tractor

The business magazine of the farm & industrial equipment industry

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Word from Ford:

Training methods have to move up, too

page 8

Computer Contracts
page 12

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INTERTEC PUBLISHING CORP.

November 21, 1981 • Vol. 96 • No. 23

Implement & Tractor

The business magazine of the farm & industrial equipment industry

in this issue...

8: **Everything Else Has To Improve. Why Not Training, Too?** A conversation with F. A. Engelhardt, Ford Tractor's training manager for North America, about the need to move ahead faster with methods to train dealers, salesmen and service technicians who function with complex and sophisticated new products.

12: **Before You Sign a Contract To Buy a Computer...**Al Dentone, a dealership information systems specialist, offers some points to consider.

20: **FIEI: In Good Health To Face Important Challenges.** President Emmett Barker tells Farm & Industrial Equipment Institute members the organization is feeling fine, but warns of serious concerns on the horizon. Robert Hanson (Deere) is elected chairman of the group.

On the cover...Joe Hussey, instructor at Ford Tractor's Southwest Training Center, Paris, Tex., prepares to demonstrate a feature of a Ford model's hydraulic system.

DEPARTMENTS

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Overland Park, KS 66212.

RETAIL SALES OF WHEEL TRACTORS*
(In Units)

	Total Wheel Tractors†				Cumulative for Jan.-Aug., 1980				Cumulative for Jan.-Aug., 1981			
	Aug. 1980		Aug. 1981		Farm Type				Farm Type			
	Farm	Non-Farm	Farm	Non-Farm	2-Wheel Drive	4-Wheel Drive	Total Farm	Non-Farm	2-Wheel Drive	4-Wheel Drive	Total Farm	Non-Farm
Alabama	119	36	93	15	1,600	51	1,651	272	1,164	23	1,187	208
Alaska	4	8	11	3	15	6	21	27	27	1	28	36
Arizona	57	34	42	18	520	63	583	317	466	50	516	254
Arkansas	149	36	204	32	2,170	223	2,393	344	1,841	235	2,076	228
California	296	192	351	126	2,820	247	3,067	1,799	2,839	312	3,151	1,381
Colorado	94	34	81	24	741	133	874	425	684	143	827	294
Connecticut	12	17	7	17	178	4	182	134	118	2	120	95
Delaware	3	6	4	15	103	5	108	31	81	2	83	35
Florida	192	80	153	95	1,649	55	1,704	771	1,489	43	1,532	740
Georgia	99	45	139	24	2,131	36	2,167	366	1,634	20	1,654	343
Hawaii	7	12	8	8	47	2	49	70	45	5	50	53
Idaho	93	8	108	6	697	89	786	95	898	150	1,048	100
Illinois	357	73	364	47	3,191	483	3,674	552	2,981	550	3,531	471
Indiana	202	36	185	22	1,947	301	2,248	325	1,645	265	1,910	225
Iowa	437	16	458	18	3,654	360	4,014	188	3,781	442	4,223	167
Kansas	400	18	312	19	2,355	502	2,857	235	1,766	361	2,127	169
Kentucky	193	45	159	7	2,754	47	2,801	337	2,259	29	2,288	320
Louisiana	179	49	128	49	1,834	174	2,008	411	1,848	159	2,007	489
Maine	19	7	13	4	170	3	173	63	155	5	160	49
Maryland	47	33	39	18	475	24	499	221	362	15	377	231
Massachusetts	7	25	4	16	105	1	106	180	102	.....	102	160
Michigan	186	53	182	33	1,561	155	1,716	539	1,613	233	1,846	407
Minnesota	395	23	253	17	2,516	365	2,881	259	2,657	401	3,058	188
Mississippi	217	39	161	18	2,255	179	2,434	274	1,713	128	1,841	185
Missouri	211	36	233	22	2,512	148	2,660	391	2,154	196	2,350	271
Montana	83	12	72	11	779	178	957	150	593	185	778	97
Nebraska	186	12	214	1	2,117	241	2,358	119	1,871	192	2,063	95
Nevada	8	13	10	10	84	8	92	91	56	9	65	81
New Hampshire	11	2	11	6	93	.....	93	56	88	.....	88	60
New Jersey	22	42	16	25	206	2	208	335	152	.....	152	279
New Mexico	23	10	22	14	288	16	304	147	234	28	262	147
New York	198	62	127	65	1,687	70	1,757	604	1,468	120	1,588	495
North Carolina	124	34	135	31	2,177	32	2,209	423	1,708	34	1,742	360
North Dakota	214	5	129	5	961	469	1,430	87	1,175	498	1,673	62
Ohio	251	70	169	27	2,431	227	2,658	586	1,937	250	2,187	417
Oklahoma	278	44	232	58	1,870	279	2,149	423	1,601	206	1,807	458
Oregon	123	40	81	14	924	52	976	264	782	65	847	183
Pennsylvania	139	101	110	46	1,481	38	1,519	732	1,273	41	1,314	522
Rhode Island	1	2	1	2	12	.....	12	29	14	.....	14	20
South Carolina	70	35	57	22	1,033	34	1,067	248	756	27	783	233
South Dakota	142	4	141	6	995	154	1,149	56	936	179	1,115	43
Tennessee	161	34	142	18	2,120	62	2,182	292	1,752	41	1,793	207
Texas	720	292	964	259	6,386	414	6,800	2,423	6,726	410	7,136	2,422
Utah	50	23	52	9	433	17	450	220	434	20	454	178
Vermont	30	5	28	1	230	1	231	26	212	3	215	31
Virginia	116	38	91	20	1,486	20	1,506	381	1,053	14	1,067	249
Washington	130	34	112	10	1,214	109	1,323	294	975	121	1,096	263
West Virginia	27	14	19	6	343	.....	343	140	232	.....	232	86
Wisconsin	360	37	223	20	3,157	128	3,285	329	2,765	169	2,934	244
Wyoming	25	9	23	13	227	26	253	109	255	27	282	109
U.S. Government	57	23	.....	.....	195	.....	195	560	9	.....	9	60
Miscellaneous‡	1	5	33	37	229	.....	229	429	181	.....	181	440
TOTAL	**7,525**	**1,964**	**6,906**	**1,409**	**71,158**	**6,233**	**77,391**	**18,183**	**63,560**	**6,409**	**69,969**	**14,942**

Data released October 21, 1981, Farm & Industrial Equipment Institute.

*Figures do not include garden tractors, motor tillers or contractors off-highway types. Report includes units marketed by these firms: Allied Farm Equip. (Leyland Satoh); Allis-Chalmers; Belarus; J I Case; Deere; Deutz; Ford; International Harvester; Long; Massey-Ferguson; R. M. Wade (Satoh); Steiger; Versatile; and White.

†The monthly sales are those reported for that month only. The cumulative totals are subject to revision reflecting updating in the basic sales data.

‡Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

I&T
SINCE 1886

AUCTION PRICES OF USED EQUIPMENT

An exclusive I&T monthly report of actual prices paid recently at these leading national wholesale auctions.

Asterisk beside tractor price indicates highest bid offered on tractors which were not sold.

JONES FARM EQUIPMENT CO. Dothan, Alabama (October 13, 1981)

ALLIS-CHALMERS TRACTORS

7080 diesel, cab, duals, 1978 (Good)	13,000*
7080 diesel, cab, duals, 1977 (Good)	13,000
7040 diesel, 1977 (Fair)	7800
7040 diesel, cab, duals, 1976 (Good)	10,500*
7040 diesel, cab, duals, 1976 (Good)	10,000*
7020 diesel, cab, duals, 1978 (Good)	11,000*
200 diesel, 1973 (Good)	5800
175 diesel, 1978 (Excellent)	8500

CASE TRACTORS

1370 diesel, cab, duals, 1976 (Good)	8000
580C diesel, ldr., 1977 (Good)	6600
480C diesel, ldr., 1977 (Excellent)	8200*
470 diesel, 1971 (Fair)	2000

DAVID BROWN TRACTOR

770 diesel, 1966 (Good)	1800*

MASSEY-FERGUSON TRACTORS

2675 diesel, 1979 (Excellent)	14,500*
1085 diesel, 1977 (Good)	6300
1085 diesel, 1974 (Fair)	5400
255 diesel, 1976 (Excellent)	6800
245 diesel, 1978 (Excellent)	6000
175 diesel, 1974 (Excellent)	4550
175 diesel, 1972 (Excellent)	4200*
175 diesel, 1969 (Good)	3450*
165 diesel, 1966 (Excellent)	4100
165 diesel, 1966 (Excellent)	3850
135 diesel, 1974 (Excellent)	3700*
135, 1971 (Good)	3150
135, 1966 (Fair)	2300
50 diesel, ldr., backhoe, 1976 (Excellent)	5600
50, 1961 (Good)	2000*
35, 1963 (Good)	1750
35, backhoe, 1956 (Fair)	1500
35, 1956 (Good)	1600*
30 diesel, 1970 (Rough)	1000
T030, 1953 (Good)	975
T020, 1951 (Good)	1050

FORD-FERGUSON TRACTORS

9N, 1946 (Fair)	675
9N, 1941 (Good)	900

FORD TRACTORS

7000 diesel, 1972 (Good)	5750
5000 diesel, 1974 (Excellent)	5500
5000 diesel, 1973 (Excellent)	5000
5000 diesel, 1971 (Good)	4250
4500 diesel, ldr., backhoe, 1968 (Good)	4550
4410 diesel, 1970 (Rough)	1450
4000 diesel, 1974 (Excellent)	4450
4000 diesel, 1973 (Fair)	2900*
4000 diesel, 1969 (Good)	3470
4000, 1968 (Fair)	2600*
4000, 1968 (Good)	3150
3400 diesel, 1965 (Fair)	2100
3000 diesel, 1972 (Excellent)	3700*
3000 diesel, 1972 (Good)	3500
3000, 1967 (Good)	2900
3000, 1965 (Good)	2750
2000 diesel, 1971 (Excellent)	4500
1000 diesel, 1976 (Good)	3200*
851 diesel, 1958 (Good)	1600
841, 1958 (Good)	2250
641, 1960 (Good)	2050
640, 1957 (Good)	1550
640, 1956 (Excellent)	2100
640, 1955 (Fair)	1250*
535 diesel, ldr., backhoe, 1977 (Excellent)	9500*
Dexta, 1960 (Good)	825
NAA, 1954 (Good)	1650
Jub., 1953 (Fair)	950
8N, 1951 (Good)	1100
8N, 1950 (Good)	1450*
8N, 1948 (Good)	1000
8N, 1948 (Good)	1250
8N, 1948 (Fair)	950

INTERNATIONAL HARVESTER TRACTORS

1466 diesel, 1971 (Fair)	6500
1026 diesel, 1970 (Good)	5150
766 diesel, 1973 (Excellent)	9250
706, 1966 (Fair)	2900
666 diesel, 1973 (Good)	4800
584 diesel, 1979 (Excellent)	6500
504 diesel, 1967 (Good)	2350
504 diesel, bld., 1964 (Fair)	1950
504 diesel, 1964 (Rough)	750
M, 1941 (Good)	400
H, 1950 (Rough)	125
Sup. C, cult., 1953 (Fair)	400
130, cult., har., 1957 (Fair)	1250
100, cult., 1955 (Fair)	1375
Sup. A, cult., plow, 1953 (Rough)	600*
A, 1941 (Good)	450
A, cult., mo., har., 1941 (Good)	600

JOHN DEERE TRACTORS

5020 diesel, 1968 (Good)	5500
4630 diesel, cab, 1974 (Good)	11,900
4430 diesel, 1973 (Good)	9500
3020 diesel, 1969 (Excellent)	6500
3020 diesel, 1968 (Good)	5350
3010, 1963 (Fair)	2100*
2240 diesel, 1977 (Excellent)	5600*
2240 diesel, 1977 (Excellent)	6000
2040 diesel, 1977 (Good)	4000
2030 diesel, 1974 (Good)	4800*
2030 diesel, 1974 (Good)	5200
2020 diesel, 1967 (Good)	4000*
2020 diesel, 1966 (Fair)	3200*
1020 diesel, 1967 (Good)	3200
430, 1960 (Good)	1300
430 turbo, 1959 (Good)	1050*
300 diesel, ldr., backhoe, (Good)	3900*
60, 1955 (Good)	500
60, 1955 (Good)	525

LONG TRACTOR

560 diesel, (Good)	2650

MINNEAPOLIS MOLINE TRACTOR

G955 diesel, 1974 (Good)	4750

MASSEY-HARRIS TRACTORS

55 LP, 1948 (Rough)	225
30, 1949 (Fair)	400*

OLIVER TRACTORS

1855 diesel, 1974 (Good)	3850
550 diesel, 1964 (Good)	1800*
55 diesel, 1955 (Good)	850

NOTES

Prices reported are for individual sales at wholesale on "as is," "cash and carry" basis.
Prices reported are NOT averages.

Condition classifications: EXCELLENT means—Engine: in perfect condition, 400 to 600 hours of use; Rubber: 80% tread remaining, no breaks or cracks; Paint: original and bright; General Appearance: excellent.

GOOD means—Engine: good running condition; Rubber: 70% tread remaining, no breaks or cracks; Paint: original paint or a good repaint job; General Appearance: good over-all.

FAIR means—Engine: possibly in need of a minor overhaul to restore; Rubber: 60% tread remaining, some cracking evident in side walls; Paint: only fair, weathered and some rust apparent; General Appearance: worn, some dents, minor parts such as gage covers missing or broken.

ROUGH means—Engine: obviously in need of a major overhaul; Rubber: smooth; Paint: scarred, weathered, rusty, needs painting urgently; General Appearance: dents, ruptures, broken parts, loose wires, some components such as lights broken, missing or inoperative.

DEMONSTRATOR means—used for demonstrating only and in practically new condition.

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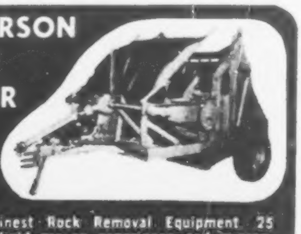

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RETAIL SALES OF SELECTED FARM EQUIPMENT – Jan.-Aug. 1980 and 1981(1)

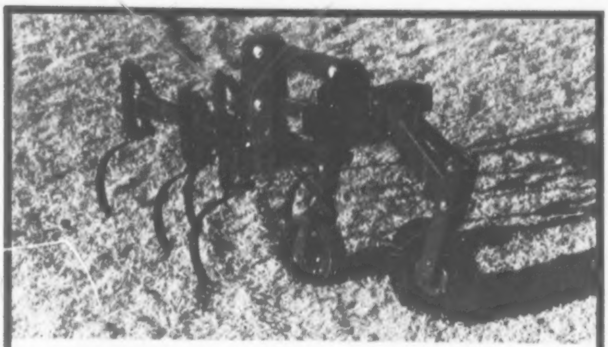
(In Units)

							Windrowers Self-Propelled							
	Combines Self-Propelled		Corn Heads		Hay Balers(2)		Power Units		Total Heads		Grinder-Mixers		Shear-Bar Forage Harvesters(3)	
	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
Alabama	98	92	34	36	100	160	2	....	1	....	92	60	19	33
Alaska	3	1	.....	.....	12	13	2	.....	2	.....	1	3	.....	.....
Arizona	35	58	.....	1	34	42	51	45	63	54	6	3	10	10
Arkansas	239	415	1	2	152	243	.....	4	.....	4	48	34	7	12
California	160	225	15	32	137	134	216	227	240	248	4	5	39	55
Colorado	209	183	56	50	303	291	162	148	170	152	47	43	40	18
Connecticut	.....	1	.....	.....	51	42	.....	.....	.....	.....	.....	.....	14	15
Delaware	18	17	12	12	8	7	1	1	1	1	8	5	6	1
Florida	47	28	34	17	50	53	.....	2	.....	2	31	11	17	17
Georgia	222	276	198	145	130	166	1	.....	1	.....	188	74	70	59
Hawaii	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....
Idaho	219	296	10	4	502	397	307	228	308	232	38	21	41	27
Illinois	962	1,081	922	930	278	202	17	10	17	11	350	273	136	148
Indiana	577	497	624	479	245	258	7	6	7	6	250	166	97	69
Iowa	1,054	1,169	1,095	1,139	250	259	108	114	114	122	852	636	321	243
Kansas	1,189	976	138	73	235	275	225	214	231	223	171	114	142	95
Kentucky	124	157	83	92	232	238	3	26	3	29	232	130	80	88
Louisiana	164	200	3	3	36	86	.....	.....	.....	.....	12	6	14	9
Maine	4	4	.....	.....	52	56	2	.....	2	.....	.....	2	18	17
Maryland	68	45	70	63	93	75	9	6	9	6	29	18	30	37
Massachusetts	.....	.....	.....	.....	41	36	6	.....	6	.....	1	.....	14	13
Michigan	191	226	157	168	269	236	50	37	51	39	163	143	209	155
Minnesota	710	834	505	481	560	545	474	460	487	469	406	369	404	345
Mississippi	186	215	2	10	53	106	1	.....	1	.....	26	25	45	36
Missouri	423	567	209	145	347	451	54	38	56	37	371	237	109	72
Montana	272	382	2	8	292	231	319	324	350	362	48	26	20	24
Nebraska	683	670	480	403	159	151	227	207	240	221	358	250	162	165
Nevada	2	2	.....	.....	34	26	32	33	38	35	2	2	7	4
New Hampshire	.....	.....	.....	....	48	41	.....	.....	.....	.....	.....	2	9	12
New Jersey	14	8	9	6	24	29	.....	.....	.....	.....	6	7	9	5
New Mexico	23	29	8	1	96	96	48	41	51	40	10	6	...	2
New York	74	53	83	58	610	470	52	36	53	37	83	77	384	320
North Carolina	149	170	141	140	219	213	2	.....	2	.....	116	77	44	47
North Dakota	563	893	18	25	39	54	395	514	424	566	96	78	52	60
Ohio	501	403	395	336	391	394	8	9	8	9	276	182	143	136
Oklahoma	365	413	7	4	335	418	85	93	91	97	87	56	23	18
Oregon	139	152	4	5	347	248	194	154	205	175	19	16	26	40
Pennsylvania	82	98	98	68	582	521	42	36	44	36	214	152	271	230
Rhode Island	.....	.....	.....	.....	6	1	7	....	6	.....	.....	.....	1	1
South Carolina	96	103	66	53	54	68	.....	.....	.....	.....	44	27	25	24
South Dakota	292	321	113	103	71	68	431	368	462	400	225	139	168	147
Tennessee	138	144	63	34	326	420	1	2	1	2	143	98	72	75
Texas	663	954	170	154	487	916	72	67	77	79	155	112	61	56
Utah	27	31	7	1	277	250	92	91	97	96	22	8	44	20
Vermont	.....	4	.....	2	100	86	3	4	3	4	.....	2	81	58
Virginia	60	53	53	44	319	243	7	6	7	7	67	42	77	66
Washington	279	336	13	15	363	302	143	96	146	121	15	7	81	54
West Virginia	.....	3	.....	3	125	113	1	.....	1	.....	21	8	3	8
Wisconsin	247	241	279	227	1,135	950	280	212	284	212	377	312	1,081	833
Wyoming	34	45	1	5	151	162	144	125	154	127	15	11	15	11
U.S. Government	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miscellaneous (4)	.....	3	.....	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
TOTAL	**11,605**	**13,079**	**6,179**	**5,589**	**10,760**	**10,842**	**4,283**	**3,984**	**4,514**	**4,261**	**5,725**	**4,075**	**4,743**	**3,990**

Data released October 21, 1981, Farm & Industrial Equipment Institute.

(1) Includes revisions for prior months.
(2) For making bales of under 200 lbs.
(3) Pull-type, mounted, self-propelled.
(4) Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

Mower Conditioners All Types		Manure Spreaders Conveyor-Type		
1980	1981	1980	1981	
110	143	15	10	Alabama
5	9	1	2	Alaska
8	12	6	6	Arizona
279	398	73	67	Arkansas
31	36	31	32	California
121	108	51	35	Colorado
77	41	52	44	Connecticut
15	7	45	39	Delaware
38	51	20	18	Florida
179	176	35	24	Georgia
.....	.....	1	.....	Hawaii
132	125	72	65	Idaho
455	440	428	366	Illinois
386	416	340	330	Indiana
810	780	946	921	Iowa
446	523	156	96	Kansas
662	742	215	200	Kentucky
34	63	18	12	Louisiana
77	82	72	48	Maine
87	79	167	110	Maryland
41	39	54	51	Massachusetts
489	359	520	463	Michigan
776	799	896	824	Minnesota
70	85	16	16	Mississippi
981	1,224	243	193	Missouri
124	143	37	16	Montana
357	338	277	140	Nebraska
7	6	5	2	Nevada
64	44	41	27	New Hampshire
41	25	36	29	New Jersey
13	14	5	4	New Mexico
867	772	876	881	New York
189	192	109	87	North Carolina
90	160	71	48	North Dakota
610	514	592	493	Ohio
509	576	46	23	Oklahoma
229	156	73	55	Oregon
711	595	869	717	Pennsylvania
4	3	.....	.....	Rhode Island
59	101	23	10	South Carolina
50	100	147	130	South Dakota
477	614	132	95	Tennessee
856	1,241	104	111	Texas
138	140	84	60	Utah
177	134	152	131	Vermont
573	396	167	103	Virginia
217	158	96	69	Washington
127	123	44	44	West Virginia
1,858	1,335	1,415	1,250	Wisconsin
30	47	29	17	Wyoming
.....	.....	.....	.....	U.S. Government
.....	.....	.....	.....	Miscellaneous
14,676	**14,664**	**9,903**	**8,514**	TOTAL



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December 15, 1981
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Implement&Tractor

The business magazine of the farm & industrial equipment industry

Knecht's 31 points for fix-up of used machines

page 8

Manufacturers Edition
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December 15, 1981 • Vol. 96 • No. 24

Implement & Tractor

The business magazine of the farm & industrial equipment industry

in this issue...

8: **Knecht's 31 Points: They Make Used Stuff Desirable.** Paola, Kan., dealer George Knecht uses a systematic approach to reconditioning used equipment to satisfy the growing needs of part-time farmers and to keep his shop busy.

14: **Wholesalers: Another Hardworking Convention.** FEWA members get heavily into panel discussions and host several hundred manufacturers at their dating session. Bob Lemay moves from acting president to president.

18: **FEMA Members Hear an Upbeat Outlook.** *Farm Journal's* John Marten sees a better 1982 in the agricultural economy than many others do. Snowco's Ed Elstun is elected president.

22: **Manufacturers Reps Seek Continued Growth.** AIMRA conducts its 20th annual convention with 110 of its 192 member firms represented. New president is Ray Badger.

48: **Is There a 'Best' Way to Repair Hydraulic Hose?** Manufacturers comment on merits of swaging and crimping fittings onto hydraulic hose.

On the cover... Brad Thompson finishes spraying a new coat of paint on a reconditioned tractor as dealer George Knecht watches.

DEPARTMENTS

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what's ahead...

I&T
SINCE 1886

December 15, 1981

OCTOBER RETAIL SALES OF FARM EQUIPMENT IN THE U.S. took a tumble in every product department covered in the FIEI flash report. The brightest, or least dreary, spots are combines, conventional balers and mower-conditioners, which for the year to date are only marginally under the levels of 1980.

	Unit Retail Sales					
	October			January-October		
	1981	1980	Pct. Change	1981	1980	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
40-100 hp	5,170	6,501	-20.5	44,400	51,896	-14.4
Over 100 hp	5,555	7,217	-23.0	36,408	42,964	-15.3
Total 2-wheel drive	10,725	13,718	-21.8	80,808	94,860	-14.8
4-wheel drive	882	1,666	-47.1	8,020	8,943	-10.3
Total Tractors	11,607	15,384	-24.6	88,828	103,803	-14.4
Combines (S-P)	5,593	5,855	- 4.5	21,446	21,589	- 0.7
Balers*	1,041	1,128	- 7.7	12,991	13,086	- 0.7
Forage Harvesters**	1,266	1,780	-28.9	6,523	8,205	-20.5
Mower-Conditioners	1,298	1,548	-16.1	17,575	17,889	- 1.8

*Bales under 200 lbs. **Shear-bar type.

CANADIAN RETAIL SALES IN OCTOBER were also disappointing. The decline in tractor sales is believed to be due largely to severely depressed sales in eastern Canada in the 40-99 horsepower size group.

	Unit Retail Sales					
	October			January-October		
	1981	1980	Pct. Change	1981	1980	Pct. Change
Farm Wheel Tractors	3,977	5,085	-21.4	23,834	25,826	- 7.7
Combines (S-P)	1,015	914	+11.1	4,275	3,445	+24.1
Balers*	324	369	-12.2	3,068	3,822	-19.7
Mower-Conditioners	280	286	- 2.1	3,754	3,991	- 5.9

WORLD PROSPECTS FOR COARSE GRAIN CROPS for the 1981-82 year, says the USDA's Foreign Agricultural Service, are now estimated to be 1,623.7 million metric tons, compared with 1,539.2 million in 1979-80 and 1,559.5 million (preliminary) in 1980-81. For the U.S., the projection is 329.2 million metric tons in 1981-82, compared with 302.8 million in 1979-80 and 269.8 million in 1980-81. As for oilseeds, the world is expected to produce 173.9 million metric tons in 1981-82; for the U.S., it's 66.3 million metric tons. Cotton: 70.9 million bales worldwide in 1981-82, 15.6 million bales in the U.S.

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I&T
SINCE 1886

AUCTION PRICES OF USED EQUIPMENT

An exclusive I&T monthly report of actual prices paid recently at these leading national wholesale auctions.

Asterisk beside tractor price indicates highest bid offered on tractors which were not sold.

YODER & FREY, INC.
Archbold, Ohio
(November 10, 1981)

ALLIS-CHALMERS TRACTORS

7040 diesel, 1974 (Good)	9400*
XT190, 1973 (Good)	4200*
XT190, ser. 3, 1972 (Fair)	4200*
XT190, 1966 (Fair)	2450*
170, 1970 (Good)	3500*
170, 1970 (Fair)	3400*
D17, 1965 (Fair)	1500*
D15, 1964 (Fair)	1100
D14, 1964 (Rough)	925*
D12, 1963 (Rough)	1075*
WD45, 1953 (Good)	1100*
WD45, 1953 (Fair)	750
WD45, ldr., (Rough)	530
WD, 1955 (Good)	850*

CASE TRACTORS

1490 diesel, (New)	9100*
1070 diesel, 1972 (Rough)	9000*
1030 diesel, 1965 (Fair)	3600*
1030 diesel, 1965 (Fair)	3400*
930, 1967 (Good)	3050*
830 diesel, 1965 (Fair)	2150*
830, 1965 (Rough)	1500*
830 diesel, 1965 (Rough)	1000*
530, 1965 (Rough)	1325
400, 1956 (Good)	1100*
400, 1956 (Fair)	850
400, 1955 (Fair)	925

DAVID BROWN TRACTORS

1200, 1970 (Good)	3400*
990, 1961 (Rough)	1100

DEUTZ TRACTOR

130-06, 1978 (Good)	8000*

FERGUSON TRACTOR

40	800

JOHN DEERE TRACTORS

5020 diesel, 1970 (Good)	6800
4520 diesel, 1970 (Good)	8750*
4520 diesel, 1970 (Fair)	6950
4030 diesel, 1977 (Rough)	8600
4020 diesel, 1967 (Fair)	6700*
4020 diesel, 1967 (Fair)	5750
4020 diesel, 1966 (Good)	7250*
4020 diesel, 1966 (Rough)	5700*
4010 diesel, 1963 (Good)	4950
4010 diesel, 1963 (Fair)	3000
3010 diesel, 1964 (Good)	3000*
3010, 1963 (Good)	2725
3010 diesel, 1962 (Rough)	2200
730 diesel, 1959 (Fair)	2200*
730 diesel, 1959 (Fair)	2150*
730 diesel, 1958 (Fair)	1700*
720 LP, 1958 (Rough)	1100*
520, 1957 (Good)	1570*
520, 1957 (Fair)	1450*
430, 1958 (Good)	1525
420, 1959 (Rough)	850*
70 diesel, 1956 (Fair)	1300*
70, 1956 (Fair)	1200*
70, 1953 (Fair)	1000*
60, 1956 (Good)	1175
A, 1946 (Fair)	420
B, 1948 (Fair)	325
40, 1956 (Fair)	1200
M, plow, cult., side dresser	785

FORD TRACTORS

9600, 1975 (Good)	7600*
8000, 1973 (Fair)	7500*
8000, 1971 (Good)	5900*
7600, 1979 (Excellent)	9100*
5000 diesel, 1971 (Good)	5750*
5000, 1969 (Rough)	3600*
4000, 1971 (Rough)	3250
4000, 1959 (Rough)	1460
4000, Select-O-Speed, (Rough)	925*
3000, 1969 (Good)	3400*
3000, 1967 (Fair)	2375*
900, 1956 (Fair)	1100*
860, bld., 1955 (Good)	1600
Dexta, 1958 (Fair)	1250*
Jub., bld., 1953 (Good)	1800
Jub., 1953 (Fair)	1375*
8N, 1952 (Good)	1300
8N, 1952 (Fair)	1250*
8N, 1950 (Rough)	1150
8N, 1950 (Rough)	850
8N, 1949 (Fair)	1075
8N, 1948 (Rough)	950
8N, 1946 (Rough)	650
9N, 1945 (Fair)	900
9N, 1945 (Rough)	775
9N, 1945 (Rough)	550

INTERNATIONAL HARVESTER TRACTORS

1568 diesel,	10.000
1466, 1974 (Rough)	8500*
1066 diesel, 1975 (Fair)	7100*
1066 diesel, 1975 (Rough)	6800*
1066 diesel, 1973 (Good)	7250*
806 diesel, 1966 (Fair)	4300*
806, 1963 (Fair)	3200*
706 diesel, 1964 (Fair)	3900
706, 1964 (Rough)	2300*
656, 1967 (Fair)	3650*
656, 1967 (Rough)	2700*
606 diesel, 1966 (Fair)	2400

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574, 1973 (Good)	5425
560, 1960 (Fair)	2050*
560, 1960 (Rough)	1100*
460 diesel, 1960 (Fair)	1500*
450, 1957 (Good)	1150*
450 diesel, 1957 (Rough)	700
400, 1958 (Rough)	925*
384 diesel, 1980 (Excellent)	4350*
354, 1973 (Fair)	2550
350, 1956 (Fair)	1050*
200, 1959 (Fair)	825*
140, 1963 (Fair)	1600*
MTA, 1953 (Good)	1125*
MD, 1952 (Rough)	700*
M, 1950 (Good)	1050*
MTA, 1950 (Fair)	800
M, 1950 (Rough)	625
Sup. H. cult., 1952 (Fair)	850*
Cub Loboy, 1958 (Good)	975

MASSEY-FERGUSON TRACTORS

1085 diesel, 1979 (Excellent)	8400*
275, 1974 (Fair)	6750*
202, ldr.	3400
165, 1970 (Fair)	3675
165, 1969 (Good)	3850
165, 1967 (Fair)	3350*
165 diesel, 1967 (Fair)	3000*
165, 1966 (Rough)	2675
150, 1967 (Rough)	2525
135, 1967 (Fair)	3000*
135, ldr., 1969 (Good)	3150
135, 1965 (Fair)	2300
35, 1956 (Good)	1850*

MINNEAPOLIS MOLINE TRACTORS

G1000, 1970 (Good)	3300*
G900, 1968 (Good)	3350
602, 1964 (Fair)	1900*

OLIVER TRACTORS

2050 diesel, 1969 (Rough)	5450
1955 diesel, 1970 (Good)	6250*
1860,	2500
1800 diesel, 1960 (Rough)	1700*
770, 1958 (Rough)	725*
550 diesel, 1960 (Fair)	1100*
77, (Rough)	275

NOTES

Prices reported are for individual sales at wholesale on "as is," "cash and carry" basis.
Prices reported are NOT averages.

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FAIR means—Engine: possibly in need of a minor overhaul to restore; Rubber: 60% tread remaining, some cracking evident in side walls; Paint: only fair, weathered and some rust apparent; General Appearance: worn, some dents, minor parts such as gage covers missing or broken.

ROUGH means—Engine: obviously in need of a major overhaul; Rubber: smooth; Paint: scarred, weathered, rusty, needs painting urgently; General Appearance: dents, ruptures, broken parts, loose wires, some components such as lights broken, missing or inoperative.

DEMONSTRATOR means—used for demonstrating only and in practically new condition.

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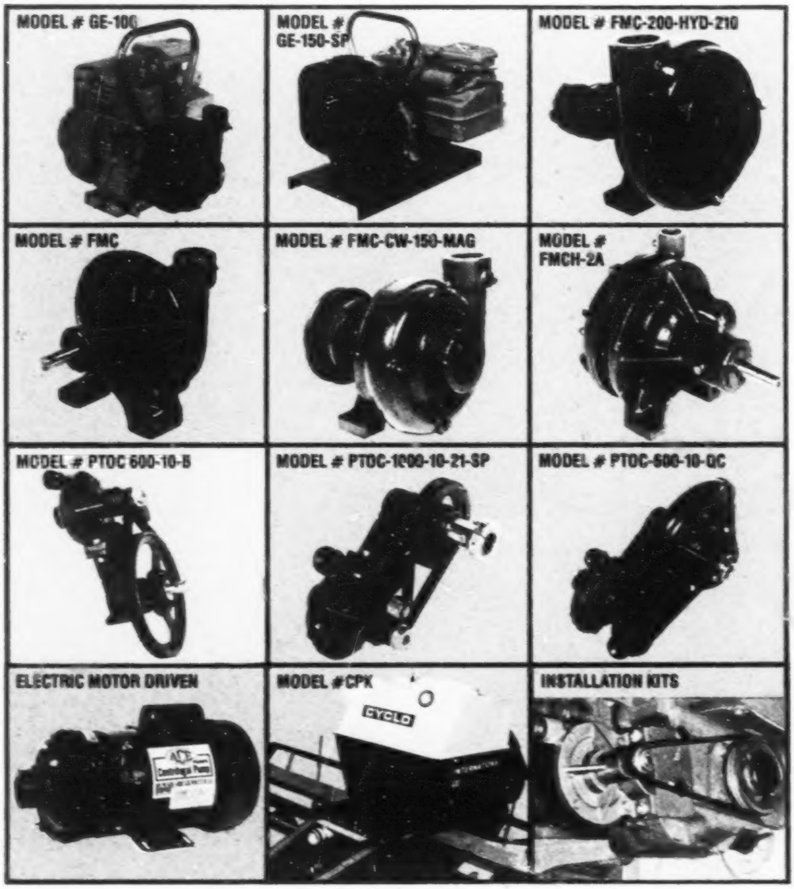

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January 7, 1982
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Implement&Tractor

The business magazine of the farm & industrial equipment industry

17th Annual Engineering Concepts Issue

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January 7, 1982 • Vol. 97 • No. 1

Implement & Tractor

The business magazine of the farm & industrial equipment industry

17th Engineering Concepts Issue

An Update: The Movement to Less Tillage

11: Introduction

12: Minimum Tillage Practices. Agricultural engineers from eight areas of the country answer I&T's questions concerning changes in tillage practices; the reasons for the changes; their effects on yields, operating costs and crop mixes; the most important changes in tillage the past ten years; what changes are coming, and what changes should be made.

26: A New Tillage Tool. The Paraplow, developed in England, has a slant-leg design that, according to the manufacturer, is capable of breaking up areas of compaction to a depth of 14 inches while causing only minimum surface disturbance.

28: Reduced Tillage Practice: How It Has Grown. A 10-year history of the growth of no-till and minimum-till practices and a state-by-state comparison of tillage practices.

On the cover...the effects of disking and moldboard plowing contrast sharply as seen in this side-by-side comparison in a Missouri corn field.

DEPARTMENTS

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what's ahead...

January 7, 1982

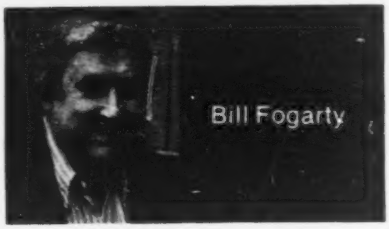
FIRST FORECAST: CANADIANS LOOK AT 1982. Meeting in late November in Toronto, member firms of the Canadian Farm & Industrial Equipment Institute presented the following product unit sales forecasts (along with preceding sales data):

	Unit Retail Sales		
Product	1980(a)	1981(e)	1982(f)
Farm Wheel Tractors			
All, Eastern Canada	13,883	12,676	13,078
All, Western Canada	15,266	16,210	16,014
Two-Wheel Drive:			
9-19 hp	1,421	1,605	1,508
20-39.9 hp	2,669	2,593	2,511
40-99.9 hp	13,526	11,504	11,809
100 hp and over	8,728	9,167	9,192
Four-Wheel Drive:			
Under 200 hp	2,085	2,535	2,548
200 hp and over	1,606	1,815	1,900
Front-Wheel Assist:			
Under 40 hp	1,962	2,091	2,135
40-99.9 hp	2,400	2,569	2,744
100 hp and over	357	370	394
Total All Farm Wheel Tractors	29,149	28,886	29,092
Swathers, Self-Propelled	4,641	4,358	4,264
Swathers, Pull-Type	3,881	4,100	3,883
Combines, Self-Propelled	4,077	4,700	4,416
Combines, Pull-Type	2,930	2,918	3,001
Corn Heads	960	918	931
Balers (under 200 lbs.)	4,093	3,328	3,205
Balers (200 lbs. and over)	3,902	3,631	3,785
Forage Harvesters (shear-bar type)	1,587	1,556	1,523
Mower-Conditioners	4,300	4,085	4,083
Moldboard Plows (pull-type, mounted)	5,183	4,586	4,545
Chisel Plows	4,196	4,179	4,071
Diskers	2,084	2,161	2,099
All Disk Harrows	6,020	5,606	5,553
All Grain Drills	7,712	7,883	7,666
Corn Planters	1,505	1,574	1,530
Manure Spreaders	3,215	3,216	3,066
Grinder-Mixers	1,685	1,600	1,550

Source: Canadian Farm & Industrial Equipment Institute. (a) actual retail sales. (e) actual sales plus estimates on 4th period. (f) forecast by participating manufacturers of CFIEI.

(Continued on facing page)→

EDITOR'S NOTEBOOK



How Goes It With Salesmen?

If I had thought of it in time, I would have named 1981 "The Year of the Salesman." In what most people consider the toughest farm and industrial equipment sales year in decades, what good would that have done? Not much, I'm sure. But it might have offered some consolation to the people who make things happen in this industry, or any industry.

Remember, in a year like last year, even though the unit sales were down, the *selling* went up. If it was a tough year for salesmen, it was a worse year for order takers.

What could I have done to recognize the hard work, disappointments and rare triumphs that went with selling farm equipment in 1981? Perhaps I could have sponsored some sort of contest. In it, the salesman who convinced a panel of judges (debt-ridden farmers who hadn't bought anything new since the Eisenhower administration) that his 1981 market had been the toughest in which any salesman had to survive would have been declared winner. Prize: I&T would have bronzed a pair of shoes—the salesman's own—with holes in the soles. They could then have been hung over the mirror of the salesman's car or pickup as he continued working his territory.

And now, many of the industry watchers are telling us that 1982, or at least the first part of it, is not going to be much better. I hope they're wrong, but just in case they're right, I hereby proclaim 1982 to be The Year of the Salesman. All of us who don't sell, but who depend on the salesman getting something started out there for our own livelihood, should resolve to back him up as best we can.

All this came to mind the other day as I looked over a recent study by the Far West Equipment Dealers Assn. that dealt in part with incomes derived by dealerships' salesmen and sales managers.

Actually, 1981 wasn't too bad a year for dealers as a whole in Arizona, California and Nevada. Their salesmen, according to the survey, had gross median earnings of $26,400. (But if you think salesmen out there making that kind of dough have it made, check out their tax, real estate and utility costs before you start packing your bags.)

Here are some other highlights from the sales personnel part of the survey:

- **Of 189 salesmen,** 167 were on a mix of salary and commission. Of the others, 11 were straight salary (median, $20,000) and 11 were commission only (median, $22,800). The highest straight salary was $21,300; the best commission-only income reported was $33,500.

(More...)

NOVEMBER RETAIL SALES IN THE U.S., according to the FIEI flash report, were off in all categories except self-propelled combines, which were up almost 40 per cent for the month. The numbers:

	Unit Retail Sales					
	November			January-November		
	1981	1980	Pct. Change	1981	1980	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
40-100 hp	3,196	3,000	+ 6.5	47,219	54,896	-14.0
Over 100 hp	3,150	4,651	-32.3	39,709	47,615	-16.6
Total 2-wheel drive	6,346	7,651	-17.1	86,928	102,511	-15.2
4-wheel drive	844	1,039	-18.8	8,862	9,982	-11.2
Total Tractors	7,190	8,690	-17.3	95,790	112,493	-14.8
Combines (S-P)	3,465	2,481	+39.7	24,910	24,070	+ 3.5
Balers*	322	525	-38.7	13,369	13,611	- 1.8
Forage Harvesters**	802	916	-12.4	7,325	9,121	-19.7
Mower-Conditioners	441	822	-46.4	18,011	18,711	- 3.7

*Bales under 200 lbs. **Shear-bar type.

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Reduced tillage practice: How it has grown

American farmers were expected to use reduced tillage farming practices—no-till and minimum tillage combined—on 31.9 per cent of the nation's cropland in 1981.

This figure reported in *No-Till Farmer* magazine, is based on data gathered last January from state agronomists of the Soil Conservation Service in all 50 states and Puerto Rico.

No-till—3.3 million acres in 1972—was expected to total more than 8 million acres in 1981, eclipsing the previous high of 7.5 million acres in 1976.

Minimum tillage acreage the past ten years increased even more rapidly and represents the real growth area in the reduced tillage area, according to *No-Till* editor Frank Lessiter. In 1972, 26.3 million acres were minimum tilled, compared with an anticipated 88.1 million acres in 1981.

Adding both the no-till and minimum tillage land, the U.S. has gone from a total of 26.7 million acres of reduced tillage in 1972 (17 per cent of total U.S. cropland) to an estimated 96.8 million acres in 1981.

On a national basis, farmers were expected to no-till more corn, soybeans, grain sorghum, cotton and small grains in 1981. The only anticipated decreases in no-till acreages were for pasture renovation and vegetable crops.

Table 1 compares three types of tillage practices state-by-state for 1980 and 1981.

A big growth area for no-tillage expected in 1981 was for small grains. Farmers no-tilled 676,000 acres of grains in 1980 and were expected to increase the acreage to 1.6 million acres during 1981.

Pennsylvania was expected to

(More...)

Table 1 **State-by-state tillage comparison, 1980-1981**

State	No-Tillage 1980	No-Tillage 1981	Minimum-Tillage 1980	Minimum-Tillage 1981	Conventional Tillage 1980	Conventional Tillage 1981
Alabama	194,530	225,850	229,600	398,150	3,885,500	3,582,700
Alaska	100	500	4,800	7,000	8,475	26,000
Arizona	11,000	13,700	255,000	290,000	1,120,000	1,082,300
Arkansas	15,750	21,000	329,200	362,000	6,760,600	6,805,800
California	1,100	1,500	1,310,000	1,369,500	4,138,900	4,144,000
Colorado	6,500	6,500	2,311,000	2,311,000	3,126,700	3,126,700
Connecticut	1,695	2,025	13,425	15,000	37,650	36,000
Delaware	116,709	135,251	311,714	311,221	156,267	140,306
Florida	5,311	7,000	112,105	132,990	330,371	348,790
Georgia	435,350	586,400	3,395,000	3,465,000	855,000	755,000
Hawaii					297,000	310,500
Idaho	9,300	16,000	2,701,000	2,711,000	3,265,000	3,255,000
Illinois	660,600	670,800	5,990,200	6,267,000	15,613,800	15,469,000
Indiana	463,588	480,000	3,443,545	3,500,000	6,669,588	6,000,000
Iowa	115,136	128,000	11,059,344	11,202,000	9,861,020	9,706,000
Kansas	325,000	377,000	9,663,000	9,994,000	10,217,000	9,922,000
Kentucky	934,800	1,001,800	2,348,712	2,151,880	1,736,811	1,573,000
Louisiana	16,000	20,000	640,000	710,000	3,686,000	3,777,000
Maine	4,500	5,600	20,000	30,000	241,000	261,000
Maryland	318,485	344,785	535,591	610,065	527,734	484,546
Massachusetts	1,300	1,500	6,950	7,450	52,550	52,050
Michigan	80,500	93,000	650,000	760,000	3,900,000	3,900,000
Minnesota	173,300	220,500	4,464,000	4,913,000	15,372,100	15,305,000
Mississippi	111,000	126,500	1,560,000	1,612,500	2,390,000	2,220,000
Missouri	257,400	302,000	2,990,125	3,510,150	7,172,595	8,037,280
Montana	25,300	80,300	704,000	1,204,000	6,582,500	6,085,000
Nebraska	548,000	544,900	6,583,500	6,791,200	7,786,850	7,777,790
Nevada	112,253	114,735	55,610	58,072	112,800	113,778
New Hampshire	1,000	2,000	10,000	10,000	19,600	19,600
New Jersey	50,000	41,000	47,000	55,000	405,000	377,000
New Mexico	9,635	10,135	269,000	297,000	890,500	860,000
New York	41,510	51,450	165,300	193,000	2,051,000	2,103,000
North Carolina	270,000	273,000	1,020,000	1,090,000	3,654,000	3,598,000
North Dakota	12,000	13,000	3,864,000	4,200,000	23,224,000	22,823,000
Ohio	414,300	440,000	2,251,000	2,270,000	7,814,000	7,825,000
Oklahoma	8,900	9,600	2,150,000	2,211,300	8,086,000	7,931,000
Oregon	22,957	28,895	547,436	597,532	2,210,242	1,497,625
Pennsylvania	427,000	1,245,000	802,000	792,000	1,175,000	1,166,000
Puerto Rico	2,130	1,900	167,430	160,100	495,816	501,500
Rhode Island	97	130	175	185	8,800	9,200
South Carolina	67,762	80,150	1,100,400	1,105,000	1,745,800	1,745,000
South Dakota	29,000	15,000	4,010,000	4,500,000	13,411,000	12,940,000
Tennessee	266,200	289,000	666,000	766,000	2,387,000	2,304,000
Texas	45,400	42,500	2,193,300	3,125,000	16,735,500	15,806,700
Utah			156,500	168,500	396,000	384,000
Vermont	8,000	8,000	4,000	5,000	260,000	260,000
Virginia	350,300	377,000	469,000	501,000	1,006,500	952,800
Washington	11,783	22,047	346,454	346,600	3,382,613	3,372,203
West Virginia	45,000	53,000	5,000	10,000	55,000	50,000
Wisconsin	110,200	126,650	908,500	1,044,000	5,081,000	4,934,000
Wyoming			1,000	1,000	690,000	777,000
Totals	**7,137,681**	**8,656,603**	**82,840,916**	**88,142,395**	**211,088,182**	**206,533,168**

Definitions of each tillage system:

No-tillage: Where only the intermediate seed zone is prepared. Up to 25 per cent of surface area could be worked. Could be no-till, till-plant, rotary strip tillage, etc. Includes many forms of conservation tillage and mulch tillage.

Minimum tillage: Limited tillage, but where the total field surface is still worked by tillage equipment such as disk, chisel plow or field cultivator.

Conventional tillage: Where 100 per cent of the topsoil is mixed or inverted by plowing, power tiller or multiple diskings.

Source: *No-Till Farmer* magazine. Data supplied by state agronomists of Soil Conservation Service. Figures for 1981 are estimates.

Table 2 **A ten-year tillage comparison**

Crop Category	1981 (Estimated)	1980 (Actual)	1979 (Actual)	1978 (Actual)	1977 (Actual)	1976 (Actual)	1975 (Actual)	1974 (Actual)	1973 (Actual)	1972 (Actual)
Total no-till acres	8,858,003	7,137,681	6,689,627	7,148,144	7,271,891	7,529,358	6,545,229	5,442,507	4,875,799	3,355,467
Total minimum-till acres	98,142,395	81,393,872	78,456,453	67,687,950	62,732,242	52,137,280	49,696,662	11,294,505	39,062,755	26,355,613
No-till corn acres	3,128,252	2,943,501	3,822,527	3,651,703	3,602,732	4,615,765	4,105,843	3,305,480	3,043,157	2,069,340
No-till soybean acres	2,879,264	2,618,162	2,202,173	1,929,984	2,380,284	1,724,117	1,632,611	1,523,869	1,168,732	667,481
No-till grain sorghum acres	404,510	346,635	277,194	280,813	379,292	292,854	387,442	226,320	165,073	141,545
No-till cotton acres	2,600	1,150	3,500	3,500	7,519	5,854	6,627	6,159	3,200	1,710
No-till vegetable acres	8,100	3,185	9,260	7,982	3,705	825	12,345	10,395	7,683	6,370
No-till small grain acres	1,636,415	676,363	763,171	709,611	569,809	584,821	286,472	222,316	222,633	–
No-till pasture renovation acres	373,895	399,783	277,562	230,866	228,987	246,487	126,000	140,300	204,830	–
No-till of other crops	155,137	148,902	253,970	348,885	79,368	7,835	–	–	–	–

Source: No-Till Farmer magazine

Reduced Tillage *(continued)*

no-till 1.2 million acres and Kentucky, 1.0 million acres. Other states with more than one-half million acres of no-tilled crops expected were Illinois, Georgia and Nebraska. Twenty states were expected to no-till more than 100,000 acres each in 1981.

Table 2 shows the growth of no-till and minimum-till acreage during the past 10 years.

Actual figures for 1981 are being gathered this month and will be reported about March 1, said Lessiter, along with estimates of no-tilled, minimum-tilled and conventionally-tilled acreage, state-by-state and crop-by-crop.

Copies of the 1981-1982 survey cost $100 and may be ordered from No-Till Farmer, Inc., P.O. Box 643, Milwaukee, Wis. 53201.

Switch To Less Tillage *(Continued from page 24)*

ward in North Dakota, ag engineers there reported they are seeing a gradual increase in no-till acreage, especially when growing fall-seeded crops such as rye and winter wheat.

"Some farmers are turning to no-till to save soil and some are changing to reduce fuel use. We have found that costs are almost equal for each method if farmers place a cost on machinery depreciation, as they should," the engineers responded.

Nebraska's Dickey felt reasons for the move away from the moldboard plow include a variety of items including soil loss, fuel saving and labor requirements.

"Even though soil conservation is the most critical reason, realistically I feel the continued reduction of the farm labor supply as well as adding additional acreage have literally forced some producers to eliminate unnecessary tillage operations and to combine other operations simply to get their crop planted on a timely basis," Dickey said.

In a 1975 Illinois survey, farmers gave the following reasons for changing from conventional to conservation tillage: Save time was listed by 69 per cent; save fuel and reduce costs by 62 per cent; reduce erosion, 52 per cent; changed practices have no effect on yield, 23 per cent; because herbicides have become available, 57 per cent.

"I am sure improved planting equipment has had a significant effect in recent years in the increased adoption of conservation tillage in Illinois," Siemens wrote.

Conservation of soil and moisture is a major factor in the western and central sections of Oklahoma. However, most of the interest in minimum tillage methods comes from the desire to reduce production costs or increase farm revenue by the use of second cropping, Downs, Bloome and Stiegler reported.

Changes in tillage practices in Montana have been partially associated with soil conservation and energy savings, but the primary reason farmers are interested in no-till on dryland small grains is to trap snow and use the available moisture on an annual basis. Alternate year cropping permits soil moisture to penetrate below the crop root zone and the accumulation of moisture follows clay or shale layers until it emerges along a hillside as a saline seep, Larsen explained. This has caused a considerable amount of production loss, he said. ☐

I&T
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AUCTION PRICES OF USED EQUIPMENT

An exclusive I&T monthly report of actual prices paid recently at these leading national wholesale auctions.

Asterisk beside tractor price indicates highest bid offered on tractors which were not sold.

JONES FARM EQUIPMENT CO.
Dothan, Alabama
(November 10, 1981)

ALLIS-CHALMERS TRACTORS

7040 diesel, 1977 (Good)	10,250
5040 diesel, 1978 (Excellent)	3675
200 diesel, 1972 (Excellent)	6500*
D17 diesel, 1960 (Rough)	475
D14, corn picker, 1958 (Rough)	525

CASE TRACTORS

1070 diesel, 1978 (Excellent)	10,000
970 diesel, 1975 (Excellent)	6900
750 diesel, ldr., 1971 (Fair)	1800

DAVID BROWN TRACTORS

1210 diesel, 1974 (Excellent)	4800
880 diesel, 1967 (Good)	2300*
770 diesel, 1969 (Good)	1700

MASSEY-FERGUSON TRACTORS

1155 diesel, 1973 (Fair)	6650
1135 diesel, 1979 (Excellent)	8500
1085 diesel, 1978 (Excellent)	8000*
1085 diesel, 1977 (Excellent)	9000
1085 diesel, 1976 (Fair)	5150
1080 diesel, 1972 (Good)	4400
285 diesel, 1977 (Excellent)	7100*
275 diesel, 1977 (Good)	6600
265 diesel, 1980 (Excellent)	11,000
255 diesel, 1975 (Good)	5800
255 diesel, 1975 (Good)	5200*
245 diesel, 1979 (Excellent)	6100
245 diesel, 1979 (Excellent)	8500*
245 diesel, ldr., bld., 1977 (Good)	7200
235 diesel, 1975 (Excellent)	5200
230 diesel, 1978 (Good)	4700
230 diesel, 1977 (Excellent)	7100*
230 diesel, 1977 (Excellent)	7400
230 diesel, 1976 (Good)	4850
180 diesel, 1967 (Good)	3700
175 diesel, 1973 (Good)	3500
175 diesel, 1969 (Excellent)	4300
175 diesel, 1969 (Good)	3500
165 diesel, 1970 (Good)	3450
165 diesel, 1969 (Fair)	2400
165, 1967 (Good)	3700*
165, 1967 (Fair)	3000*
165 diesel, 1966 (Good)	3600
165 diesel, 1966 (Good)	3550
165 diesel, 1966 (Fair)	3000
135 diesel, 1973 (Excellent)	3700*
135 diesel, 1973 (Excellent)	3900
175 diesel, 1973 (Excellent)	3500*
135 diesel, 1973 (Excellent)	4000
135 diesel, 1970 (Excellent)	3400
135, 1966 (Fair)	2500*
135 diesel, 1966 (Good)	3150
135 diesel, 1966 (Good)	2900*
135 diesel, 1966 (Good)	3100
130 diesel, 1970 Fair)	2100*
65 diesel, 1964 (Good)	1900
50, 1962 (Rough)	1250
50, 1961 (Good)	1750
35 diesel, 1963 (Good)	1925
35, 1960 (Excellent)	2500
35, 1956 (Good)	1650
T030, 1953 (Fair)	800
T030, 1953 (Fair)	725
25 diesel, 1964 (Good)	1950
20, 1949 (Fair)	750*
20, 1949 (Good)	950

FORD-FERGUSON TRACTORS

9N, 1946 (Good)	1050
9N, 1944 (Good)	900

FORD TRACTORS

9000 diesel, 1971 (Fair)	4300
8700 diesel, 1977 (Excellent)	10,000*
8000 diesel, 1972 (Fair)	4100
7700 diesel, 1979 (Excellent)	9800*
6600 diesel, 1980 (Excellent)	8300
5000 diesel, 1971 (Good)	4300
5000 diesel, 1971 (Good)	4600
5000 diesel, 1970 (Excellent)	5500*
5000 diesel, 1968 (Fair)	3600
4600 diesel, 1980 (Excellent)	9500
4400 diesel, ldr., backhoe, 1966 (Good)	3800*
4000 diesel, 1968 (Good)	3400
4000, 1968 (Fair)	2825
4000 diesel, 1968 (Excellent)	4000*
4000 diesel, 1968 (Good)	3300*
4000, 1966 (Fair)	2400*
4000 diesel, 1966 (Good)	3100
4000 diesel, 1965 (Fair)	2450*
3600 diesel, 1976 (Good)	5500
3600 diesel, 1981 (Excellent)	7600
3400 diesel, ldr., backhoe, 1966 (Fair)	3300
3000 diesel, 1968 (Excellent)	3700*
3000 diesel, 1968 (Excellent)	3700*
3000 diesel, 1968 (Excellent)	3700
3000 diesel, 1968 (Good)	3300*
3000 diesel, 1966 (Good)	3500*
2600 diesel, 1979 (Excellent)	5600*
2000 diesel, 1968 (Good)	3300
2000 diesel, 1965 (Fair)	2150*
2000 diesel, 1963 (Rough)	1075
2000, 1963 (Good)	1550
1600 diesel, 1977 (Good)	2700
Major diesel, 1953 (Fair)	550
Sup. Dexta, 1963 (Good)	1525*
Sup. Dexta, 1963 (Excellent)	1800*
861, 1958 (Excellent)	2700
841, 1958 (Excellent)	2400*
641, 1959 (Good)	1950
641, 1959 (Good)	2000
640, 1956 (Rough)	1100*
NAA, 1954 (Good)	1500
Jub., 1953 (Good)	1700*
Jub., 1953 (Excellent)	1900
8N, 1952 (Excellent)	1500
8N, 1951 (Good)	1050
8N, 1950 (Good)	1050*
8N, 1948 (Rough)	550
8N, 1948 (Fair)	800

INTERNATIONAL HARVESTER TRACTORS

1566 diesel, 1975 (Good)	7500
1066 diesel, cab, 1972 (Good)	8500
806 diesel, 1966 (Good)	3750
806, 1966 (Fair)	3200*
766 diesel, 1974 (Good)	7150
656 diesel, 1966 (Good)	3500
574 diesel, 1972 (Fair)	2950*
544 diesel, 1968 (Good)	2900
504 diesel, 1964 (Fair)	1250
504 diesel, 1963 (Rough)	800
424 diesel, 1966 (Good)	2100
M, 1948 (Good)	450
Cub, plow, mo., 1948 (Rough)	675
Cub, mo., 1948 (Good)	1150*

JOHN DEERE TRACTORS

4320 diesel, 1971 (Good)	9000*
3020 diesel, 1970 (Excellent)	5800
3020 diesel, 1965 (Good)	4400
3020 diesel, 1965 (Good)	4100
3020 diesel, 1965 (Good)	4750*
3020 diesel, 1965 (Good)	4250
2630 diesel, 1975 (Excellent)	6900
2520 diesel, 1970 (Excellent)	6200
2030 diesel, 1974 (Good)	4900
2010, 1961 (Good)	1500
1020 diesel, 1968 (Good)	3250
1020 diesel, 1967 (Good)	2750
1020 diesel, 1967 (Fair)	2050*
820 diesel, 1969 (Excellent)	3700
720 diesel, 1957 (Good)	950
430, 1959 (Good)	1400*
430, 1959 (Rough)	750*
400, 1970 (Rough)	1350
301A, 1975 (Fair)	2275

LONG TRACTORS

560 diesel, (Good)	2700*
560 diesel, (Good)	3250
445 diesel, (Fair)	1625
384 diesel, (Fair)	2200
350 diesel, (Good)	3000

OLIVER TRACTORS

1955 diesel, 1973 (Good)	6000
1650 diesel, 1968 (Good)	2700
770 diesel, 1962 (Rough)	575
600 diesel, 1964 (Fair)	675

SATOH TRACTOR

S650 diesel, (Good)	2200

NOTES

Prices reported are for individual sales at wholesale on "as is," "car': and carry" basis.
Prices reported are NOT averages.

Condition classifications: EXCELLENT means—Engine: in perfect condition, 400 to 600 hours of use; Rubber: 80% tread remaining, no breaks or cracks; Paint: original and bright; General Appearance: excellent.

GOOD means—Engine: good running condition; Rubber: 70% tread remaining, no breaks or cracks; Paint: original paint or a good repaint job; General Appearance: good over-all.

FAIR means—Engine: possibly in need of a minor overhaul to restore; Rubber: 60% tread remaining, some cracking evident in side walls; Paint: only fair, weathered and some rust apparent; General Appearance: worn, some dents, minor parts such as gage covers missing or broken.

ROUGH means—Engine: obviously in need of a major overhaul; Rubber: smooth; Paint: scarred, weathered, rusty, needs painting urgently; General Appearance: dents, ruptures, broken parts, loose wires, some components such as lights broken, missing or inoperative.

DEMONSTRATOR means—used for demonstrating only and in practically new condition.

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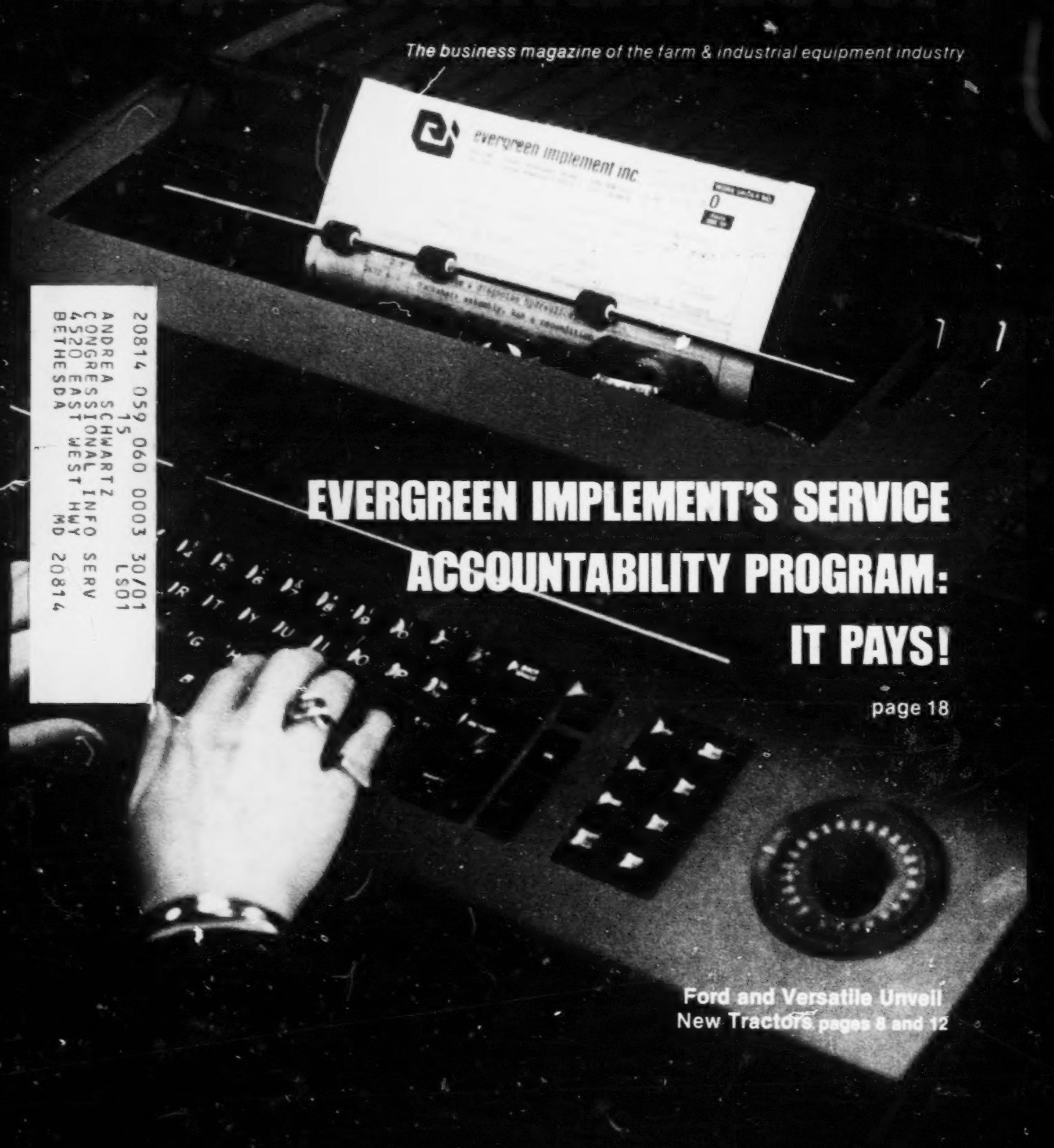
January 21, 1982
TWO DOLLARS

Implement & Tractor

The business magazine of the farm & industrial equipment industry



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EVERGREEN IMPLEMENT'S SERVICE ACCOUNTABILITY PROGRAM: IT PAYS!

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Ford and Versatile Unveil
New Tractors pages 8 and 12

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January 21, 1982 • Vol. 97 • No. 2

Implement&Tractor

The business magazine of the farm & industrial equipment industry

in this issue...

8: **Ford Aims at 30-90 HP Market With New Series 10:** Ford Tractor unveils a line of new tractors as it goes for a 25 per cent share of the North American tractor market by 1985.

12: **A 470-HP Canadian Giant:** Versatile dealers brought their prospects to Phoenix, Ariz., in December to see the new 1150 tractor and other equipment.

18: **Evergreen Implement's Service Accountability Program: It Pays!** Dealer Roger Thieme credits his service accountability program for a high level of control and profitability of his service business.

On the cover...A memory typewriter is used at Evergreen Implement, Inc., to record every job completed on a work order. The detailed statement of repairs and charges aids in customer communication and satisfaction, the dealer has found.

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RETAIL SALES OF WHEEL TRACTORS*

(In Units)

	Total Wheel Tractors†				Cumulative for Jan.-Oct., 1980				Cumulative for Jan.-Oct., 1981			
	Oct. 1980		Oct. 1981		Farm Type				Farm Type			
	Farm	Non-Farm	Farm	Non-Farm	2-Wheel Drive	4-Wheel Drive	Total Farm	Non-Farm	2-Wheel Drive	4-Wheel Drive	Total Farm	Non-Farm
Alabama	180	33	211	21	1,947	60	2,007	346	1,489	25	1,514	256
Alaska	2	4	3	17	24	6	30	37	33	1	34	62
Arizona	179	51	249	40	737	81	818	418	743	56	799	321
Arkansas	372	75	342	25	2,702	302	3,004	466	2,354	277	2,631	276
California	653	311	401	177	3,783	333	4,116	2,381	3,416	390	3,806	1,728
Colorado	208	74	128	52	995	189	1,184	555	862	180	1,042	388
Connecticut	14	24	15	9	207	5	212	185	143	2	145	117
Delaware	15	3	7	4	128	9	137	35	94	3	97	41
Florida	276	112	349	124	2,204	95	2,299	1,025	2,010	62	2,072	936
Georgia	256	94	242	43	2,627	45	2,672	528	2,079	21	2,100	415
Hawaii	6	4	4	3	61	2	63	80	52	6	58	58
Idaho	231	13	194	17	1,007	169	1,176	126	1,143	225	1,368	127
Illinois	1,048	107	450	65	4,710	750	5,460	751	3,644	681	4,325	578
Indiana	503	54	211	42	2,759	419	3,178	416	1,999	324	2,323	284
Iowa	1,173	20	433	33	5,330	618	5,948	244	4,493	508	5,001	216
Kansas	545	28	334	15	3,119	634	3,753	290	2,284	427	2,711	210
Kentucky	378	62	308	30	3,377	65	3,442	446	2,710	36	2,746	374
Louisiana	319	59	251	47	2,318	223	2,541	545	2,246	187	2,433	598
Maine	21	12	42	13	221	3	224	83	214	6	220	68
Maryland	83	50	61	36	615	28	643	304	459	17	476	286
Massachusetts	16	32	15	32	131	1	132	251	132	.....	132	204
Michigan	401	83	261	51	2,140	261	2,401	709	1,985	292	2,277	490
Minnesota	895	51	539	29	3,851	625	4,476	335	3,449	527	3,976	226
Mississippi	326	47	383	21	2,786	221	3,007	355	2,238	153	2,391	223
Missouri	537	74	485	42	3,382	215	3,597	527	2,855	231	3,086	335
Montana	160	27	131	23	1,010	253	1,263	194	772	250	1,022	136
Nebraska	611	28	222	6	2,884	325	3,209	168	2,269	224	2,493	109
Nevada	13	12	5	19	103	11	114	111	65	10	75	109
New Hampshire	17	26	18	11	127	2	129	92	116	.....	116	82
New Jersey	32	49	20	32	264	4	268	439	192	.....	192	353
New Mexico	42	24	30	20	365	19	384	202	297	32	329	183
New York	294	99	269	108	2,180	94	2,274	795	1,892	145	2,037	666
North Carolina	508	66	337	49	3,016	49	3,065	562	2,227	38	2,265	466
North Dakota	391	16	414	11	1,454	691	2,145	127	1,590	702	2,292	77
Ohio	511	98	217	37	3,157	318	3,475	783	2,267	285	2,552	529
Oklahoma	317	79	300	78	2,346	327	2,673	554	2,102	263	2,365	607
Oregon	189	61	139	21	1,203	70	1,273	358	975	92	1,067	224
Pennsylvania	232	98	174	86	1,921	48	1,969	927	1,582	51	1,633	662
Rhode Island	1	5	.....	4	15	.....	15	40	14	.....	14	27
South Carolina	132	45	77	33	1,291	43	1,334	332	905	31	936	278
South Dakota	241	20	167	7	1,419	231	1,650	86	1,181	247	1,428	62
Tennessee	289	63	307	37	2,655	85	2,740	411	2,234	50	2,284	275
Texas	1,332	374	1,705	385	8,428	543	8,971	3,126	9,220	522	9,742	3,090
Utah	78	50	62	43	569	24	593	317	529	23	552	257
Vermont	51	7	44	6	310	3	313	42	288	3	291	42
Virginia	246	39	200	28	1,915	23	1,938	491	1,362	17	1,379	292
Washington	285	54	139	45	1,669	165	1,834	417	1,186	160	1,346	330
West Virginia	34	19	33	12	409	.....	409	173	293	.....	293	118
Wisconsin	642	60	390	33	4,131	217	4,348	432	3,357	203	3,560	311
Wyoming	62	22	32	11	324	39	363	143	297	33	330	138
U.S. Government	7	11	2	40	220	.....	220	590	15	.....	15	141
Miscellaneous‡	30	37	27	61	302	.....	302	496	229	.....	229	560
TOTAL	**15,384**	**2,966**	**11,379**	**2,244**	**94,848**	**8,943**	**103,791**	**23,850**	**80,582**	**8,018**	**88,600**	**18,943**

Data released December 21, 1981, Farm & Industrial Equipment Institute.

*Figures do not include garden tractors, motor tillers or contractors off-highway types. Report includes units marketed by these firms: Allied Farm Equip. (Leyland Satoh); Allis-Chalmers; Belarus; J I Case; Deere; Deutz; Ford; International Harvester; Long; Massey-Ferguson; R. M. Wade (Satoh); Steiger; Versatile; and White.

†The monthly sales are those reported for that month only. The cumulative totals are subject to revision reflecting updating in the basic sales data.

‡Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

RETAIL SALES OF SELECTED FARM EQUIPMENT – Jan.-Oct. 1980 and 1981(1)

(In Units)

	Combines Self-Propelled		Corn Heads		Hay Balers(2)		Windrowers Self-Propelled: Power Units		Windrowers Self-Propelled: Total Heads		Grinder-Mixers		Shear-Bar Forage Harvesters(3)	
	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
Alabama	206	206	57	54	135	212	2	.....	1	.....	108	74	30	35
Alaska	5	3	.....	.....	17	14	3	.....	4	.....	1	3	.....	1
Arizona	52	71	5	1	43	50	60	56	72	65	7	5	11	13
Arkansas	585	703	5	4	173	267	.....	4	.....	4	64	38	11	14
California	259	334	52	57	160	152	262	266	289	293	5	5	62	70
Colorado	313	265	139	108	407	379	207	193	222	211	57	50	81	49
Connecticut	.....	1	.....	2	53	50	.....	.....	.....	.....	1	1	34	35
Delaware	35	24	38	24	11	8	1	1	1	1	8	8	10	2
Florida	63	51	45	26	64	77	.....	2	.....	2	39	12	22	24
Georgia	293	364	275	190	168	228	1	.....	1	.....	225	85	89	74
Hawaii	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....
Idaho	388	408	14	9	582	474	379	273	387	286	51	27	63	38
Illinois	2,315	2,201	2,414	2,165	317	235	22	10	22	12	421	320	229	189
Indiana	1,219	858	1,342	970	302	292	8	7	8	7	316	193	162	108
Iowa	2,508	2,385	2,668	2,606	306	295	124	122	130	133	1,049	820	507	355
Kansas	1,583	1,386	301	164	287	330	257	260	268	273	200	137	225	159
Kentucky	283	240	240	181	275	307	3	27	3	30	258	150	160	130
Louisiana	395	361	3	5	60	113	.....	.....	.....	.....	17	8	18	9
Maine	7	8	.....	4	67	70	2	.....	2	.....	1	2	39	28
Maryland	112	96	136	126	107	86	11	6	12	6	31	19	70	62
Massachusetts	.....	.....	.....	.....	47	44	6	.....	6	.....	3	.....	33	26
Michigan	422	382	387	368	362	276	61	44	62	45	205	163	349	243
Minnesota	1,353	1,424	1,169	1,065	688	651	609	557	627	591	489	465	765	577
Mississippi	442	436	6	14	75	123	1	.....	1	.....	38	31	59	46
Missouri	848	1,116	448	363	398	516	81	45	88	47	428	289	171	122
Montana	374	510	4	10	364	269	401	385	446	431	58	33	32	34
Nebraska	1,361	1,254	1,260	957	197	176	271	265	285	292	419	301	321	292
Nevada	3	3	.....	.....	38	29	54	45	58	49	2	2	7	7
New Hampshire	.....	.....	.....	.....	57	50	.....	.....	.....	.....	.....	2	28	24
New Jersey	24	12	14	11	37	34	.....	.....	.....	.....	7	8	15	8
New Mexico	36	38	14	6	124	131	60	54	63	58	11	8	6	6
New York	142	124	175	154	730	574	65	51	66	52	103	97	721	613
North Carolina	319	369	333	344	272	266	2	1	2	1	144	90	76	80
North Dakota	888	1,186	52	103	49	64	543	691	587	781	121	99	134	186
Ohio	958	602	886	585	498	468	8	10	8	10	326	220	230	172
Oklahoma	499	494	21	12	375	494	96	106	103	112	106	74	32	32
Oregon	216	231	8	19	395	298	242	190	263	219	23	21	42	53
Pennsylvania	151	152	231	172	700	633	49	41	51	42	249	176	466	390
Rhode Island	.....	.....	.....	.....	7	2	7	.....	6	.....	.....	.....	1	2
South Carolina	158	162	116	98	68	93	.....	.....	.....	.....	58	35	34	34
South Dakota	433	478	237	234	92	80	497	441	542	496	267	184	358	302
Tennessee	281	315	137	99	374	489	1	2	1	2	165	135	127	120
Texas	894	1,124	285	244	648	1,072	83	82	88	94	208	142	76	80
Utah	37	39	7	1	321	323	124	123	134	129	29	9	93	54
Vermont	1	7	1	9	107	101	4	5	4	5	.....	3	142	97
Virginia	98	108	106	94	362	292	7	9	7	10	84	56	162	138
Washington	407	422	30	38	429	361	178	121	180	147	17	9	129	66
West Virginia	4	3	5	3	152	127	1	.....	1	.....	22	9	24	21
Wisconsin	538	430	622	490	1,399	1,167	368	267	374	274	466	371	1,708	1,284
Wyoming	46	56	6	11	184	205	185	153	201	156	18	16	35	19
U.S. Government	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miscellaneous (4)	.....	3	6	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
TOTAL	**21,554**	**21,445**	**14,301**	**12,212**	**13,083**	**13,047**	**5,346**	**4,915**	**5,676**	**5,366**	**6,925**	**5,005**	**8,201**	**6,523**

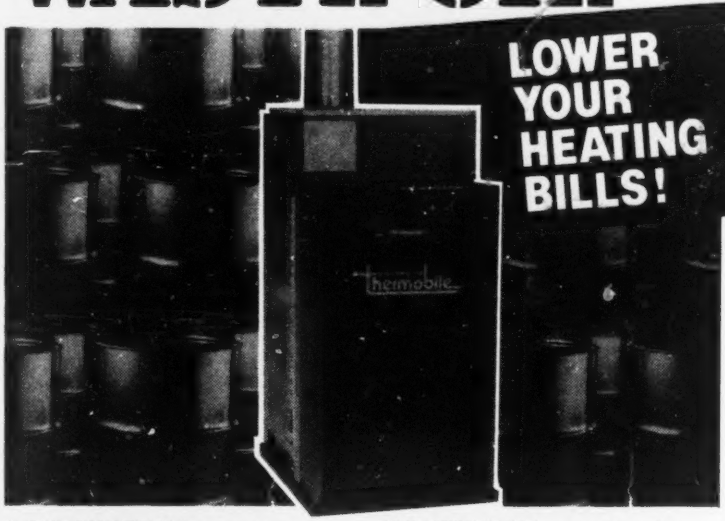
Data released December 21, 1981, Farm & Industrial Equipment Institute.

(1) Includes revisions for prior months.
(2) For making bales of under 200 lbs.
(3) Pull-type, mounted, self-propelled.

(4) Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

Mower Conditioners All Types		Manure Spreaders Conveyor-Type		
1980	1981	1980	1981	
130	167	17	14	Alabama
5	12	1	3	Alaska
9	15	6	6	Arizona
344	457	78	74	Arkansas
40	42	48	46	California
152	138	55	42	Colorado
89	48	56	51	Connecticut
16	10	50	43	Delaware
70	78	23	22	Florida
211	207	43	29	Georgia
.....	.....	1	.....	Hawaii
157	143	98	85	Idaho
569	510	491	417	Illinois
472	472	417	358	Indiana
1,005	937	1,115	1,074	Iowa
567	613	178	113	Kansas
761	837	226	216	Kentucky
44	74	25	15	Louisiana
111	100	95	55	Maine
106	91	187	121	Maryland
48	52	66	54	Massachusetts
631	451	611	547	Michigan
982	951	1,180	1,022	Minnesota
98	105	18	16	Mississippi
1,103	1,399	277	225	Missouri
144	159	44	19	Montana
434	422	303	164	Nebraska
8	9	5	4	Nevada
68	54	48	33	New Hampshire
54	36	41	35	New Jersey
18	26	9	7	New Mexico
1,082	958	1,142	1,086	New York
245	239	126	97	North Carolina
126	176	92	57	North Dakota
734	609	687	578	Ohio
576	654	47	25	Oklahoma
266	174	96	67	Oregon
867	738	1,007	845	Pennsylvania
4	3	.....	.....	Rhode Island
73	129	26	13	South Carolina
79	132	184	158	South Dakota
535	708	145	103	Tennessee
1,020	1,401	126	127	Texas
177	170	94	72	Utah
233	183	193	168	Vermont
632	477	202	121	Virginia
246	188	111	84	Washington
160	147	51	51	West Virginia
2,334	1,795	1,796	1,500	Wisconsin
50	74	36	20	Wyoming
.....	.....	.....	.....	U.S. Government
.....	.....	2	.....	Miscellaneous
17,885	**17,570**	**11,975**	**10,082**	**TOTAL**

NOW! CLEAN HEAT FROM WASTE OIL



A THERMOBILE heater can re-cycle your waste oils into clean, low-cost heat!

WHY PAY PREMIUM FUEL PRICES for heating your workshop, barns, utility sheds and other commercial buildings?

JUST POUR ANY TYPE OF WASTE OIL (up to SAE50) – diesel, paraffin, engine or hydraulic – into your new Kongskilde THERMOBILE waste oil heater, and start enjoying up to 100,000 BTU/hr. of safe, clean, odourless heat! You don't even have to filter that waste oil!

IT'S ECONOMICAL: you can recover the entire cost of the unit in just ONE COLD SEASON!

IT'S EFFICIENT: an automatic, top-mounted fan recirculates warm air outward from the combustion chamber for maximum heat output from 70,000 to 100,000 BTU/hr!

IT'S SAFE: **a separate combustion intake** lets you duct in fresh air from outside for operation in fume or dust-laden environments. An **automatic photocell flame sensor** shuts the unit down if the flame burns abnormally.

IT'S RIGHT FOR TODAY! As long as you (and your neighbours) use mechanical equipment, you'll have a ready, steady source of FREE FUEL!

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AUCTION PRICES OF USED EQUIPMENT

An exclusive I&T monthly report of actual prices paid recently at these leading national wholesale auctions.

Asterisk beside tractor price indicates highest bid offered on tractors which were not sold.

JONES FARM EQUIPMENT CO.
Dothan, Alabama
(December 8, 1981)

ALLIS-CHALMERS TRACTORS

7080 diesel, 1977 (Good)	14,000
7020 diesel, 1978 (Good)	9500
200 diesel, 1974 (Good)	6050
XT190 diesel, duals, 1969 (Good)	3000
XT190 diesel, 1968 (Fair)	1950
160 diesel, 1944 (Good)	3600
WD, 1951 (Fair)	300
CA, cult., 1956 (Rough)	275*
B, cult., 1944 (Good)	725
C, 1944 (Good)	500

CASE TRACTOR

530 diesel, ldr., 1966 (Good)	3200*

DAVID BROWN TRACTOR

990 diesel, 1968 (Good)	2250*

MASSEY-FERGUSON TRACTORS

1100 diesel, 1968 (Good)	3700
1100 diesel, 1966 (Fair)	3400*
285 diesel, 1977 (Good)	6800*
265 diesel, 1975 (Excellent)	6500*
255 diesel, 1977 (Good)	5300*
245 diesel, 1980 (Excellent)	8400*
230 diesel, 1981 (New)	7500
230 diesel, 1981 (New)	7300*
180 diesel, 1967 (Good)	3350*
175 diesel, 1974 (Excellent)	4600
175 diesel, 1967 (Good)	4350
165 diesel, 1972 (Good)	4100*
165 diesel, 1971 (Good)	3925
165 diesel, 1967 (Good)	3500
165 diesel, 1967 (Fair)	2700
165 diesel, 1967 (Good)	3400
165 diesel, 1967 (Good)	3100
165 diesel, 1967 (Good)	3650
135, 1970 (Good)	2800*
135 diesel, 1970 (Excellent)	3500*
135 diesel, 1968 (Good)	3050
135 diesel, 1966 (Fair)	2250
135 diesel, 1968 (Good)	2950*
135, 1968 (Good)	3200
135, 1967 (Fair)	2100
135 diesel, 1967 (Good)	3500
135, 1967 (Fair)	2300
135, 1966 (Fair)	2600
135 diesel, 1966 (Good)	3250*
65 diesel, 1963 (Excellent)	2400
35, 1959 (Rough)	1050
35, 1956 (Good)	1750*
35, 1956 (Fair)	1400*
TO 30, 1953 (Good)	850
TO 30, 1953 (Good)	925

FORD-FERGUSON TRACTORS

9N, 1944 (Rough)	400
9N, 1944 (Rough)	425

FORD TRACTORS

9000 diesel, 1972 (Good)	4300*
7700 diesel, 1977 (Good)	9400*
7700 diesel, 1976 (Excellent)	10,250*
7600 diesel, 1976 (Good)	8000*
7000 diesel, 1973 (Good)	6200
5600 diesel, 1977 (Excellent)	7850*
5000 diesel, 1974 (Good)	4300
5000 diesel, 1973 (Good)	4700
5000 diesel, 1972 (Excellent)	6000*
4500 diesel, ldr., 1974 (Excellent)	6600
4400 diesel, ldr., 1975 (Good)	3500
4000 diesel, 1974 (Good)	3700*
4000 diesel, 1974 (Good)	3800
4000 diesel, 1974 (Good)	4250
4000 diesel, 1968 (Fair)	3000*
4000 diesel, 1968 (Fair)	3450
4000 diesel, 1967 (Rough)	2550
3600 diesel, 1976 (Excellent)	5550
3000 diesel, 1972 (Excellent)	4550
3000 diesel, 1968 (Good)	3000
3000 diesel, 1968 (Good)	3200
3000 diesel, 1968 (Good)	3500
3000 diesel, 1968 (Good)	3100
2600 diesel, 1976 (Good)	4700*
2000, 1964 (Good)	2100*
2000, 1963 (Good)	2250*
861 diesel, 1959 (Good)	1900*
850, 1955 (Excellent)	2600
841 diesel, 1958 (Good)	2250
841 diesel, 1958 (Good)	1700
641, 1960 (Good)	2150
640, 1956 (Rough)	1000
640, 1956 (Fair)	1600
640, 1955 (Good)	2200
640, 1956 (Good)	2000
Jubilee, 1953 (Fair)	1050
Jubilee, 1953 (Good)	1800
Jubilee, 1953 (Fair)	1250
8N, 1951 (Excellent)	1500*
8N, 1949 (Good)	900*
8N, 1949 (Excellent)	1475
8N, 1948 (Fair)	750

INTERNATIONAL HARVESTER TRACTORS

1206 diesel, 1966 (Fair)	3000
1066 diesel, 1973 (Good)	5850
856 diesel, 1968 (Good)	5600*
706 diesel, 1964 (Fair)	2500*
706 diesel, 1964 (Fair)	2100
574 diesel, 1972 (Fair)	2800*
504, 1962 (Good)	1500
2444 diesel, trencher, 1968 (Good)	2600*

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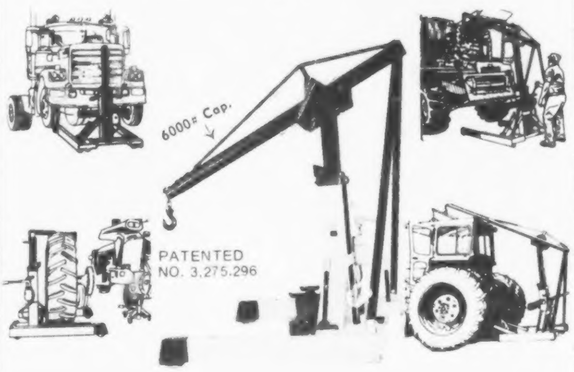

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424 diesel, 1965 (Good)	1950
404, 1967 (Good)	1850*
B275 diesel, 1958 (Fair)	775
240, 1959 (Good)	1750
M, 1944 (Fair)	300
Sup. C, 1952 (Good)	450
C, 1949 (Good)	575
Sup. A, cult., 1953 (Good)	1600*
Sup. A, cult., plt., 1951 (Good)	1325
Sup. A, har., 1948 (Rough)	700
A, cult., plow, 1942 (Good)	450*
Cub, mo., 1949 (Good)	1200
Cub, 1948 (Good)	1150

JOHN DEERE TRACTORS

4020 diesel, 1966 (Rough)	3000
4020 diesel, 1971 (Excellent)	7200
4020 diesel, 1968 (Good)	5700
4020 diesel, 1967 (Good)	6150
3010 1962 (Fair)	2400*
2840 diesel, 1979 (Excellent)	10,700*
2030 diesel, 1968 (Excellent)	5250
2030 diesel, 1968 (Excellent)	5200*
2020 diesel, 1967 (Good)	3700
2020 diesel, 1967 (Good)	3700*
2020 diesel, 1967 (Good)	3500
2020 diesel, 1967 (Good)	3600*
830 diesel, 1975 (Good)	4200*
40, 1954 (Good)	700*
450 diesel, backhoe, ldr., 1972 (Good)	9500*
430, 1959 (Good)	1500*
430, 1959 (Good)	1250*
430, 1959 (Rough)	750
420, 1957 (Rough)	550
420, 1956 (Fair)	950
300, 1970 (Fair)	1700
40S, flail mo., 1954 (Fair)	700

LONG TRACTORS

550 diesel, (Good)	3350
460 diesel, (Excellent)	5200*
360 diesel, (Excellent)	5300*
360 diesel, (Excellent)	3800
5 N-1, ldr., backhoe, (Good)	4700

MALONE TRACTOR

955 diesel, 1973 (Fair)	3100*

OLIVER TRACTORS

1750 diesel, 1968 (Fair)	2100
550 diesel, 1959 (Good)	1800*

YODER & FREY, INC.
Archbold, Ohio
(December 8, 1981)

ALLIS-CHALMERS TRACTORS

7030, 1972 (Fair)	7800*
210, 1967 (Good)	5500*
XT190, 1968 (Good)	5000*
XT190 diesel,	4150
XT190, 1967 (Fair)	3700*
170, 1967 (Good)	3000*
D17, 1965 (Good)	3500*
D17,	3500
D17, 1959 (Fair)	2500
D17, 1957 (Fair)	1750*
D17 diesel, 1957 (Fair)	1550
D12,	1250
WD45, 1952 (Good)	1075
WD45, 1950 (Fair)	900
WD,	1150
WD, 1950 (Fair)	910
WD45, (Rough)	775
CA, 1948 (Fair)	425
G-AC, cult., 1947 (Fair)	1175

CASE TRACTORS

1490, (New)	10,300
1290, 1980 (New)	7350
1190, (New)	6400*
1190, (New)	6500
1030 diesel, 1961 (Rough)	3100*
1030,	3400
970,	6500
930, 1961 (Fair)	1450*
830 diesel, 1954 (Rough)	2000*
830,	850
830,	1350

DAVID BROWN TRACTORS

1210,	3500
1200, 1963 (Fair)	2700*
1200, 1963 (Fair)	3200*

DEUTZ TRACTOR

130-06, 1970 (Fair)	7500*

JOHN DEERE TRACTORS

6030, 1974 (Fair)	11,300
4620 diesel, 1970 (Fair)	9200
4620, cab,	8550
4440, (New)	30,000*
4430, 1973 (Fair)	15,500
4430, 1974 (Fair)	15,500
4430, (Good)	14,750*
4430 diesel, 1973 (Fair)	14,000*
4320, 1971 (Good)	9000*
4020, 1965 (Fair)	5850*
4020, 1966 (Good)	6900*
4020 diesel, 1965 (Fair)	6000*
4020, 1966 (Fair)	6800*
4020,	6550
4020 diesel, 1967 (Fair)	7150*
4020 diesel, 1965 (Fair)	6200*
4020, 1962 (Fair)	3550
4020 diesel, 1965 (Fair)	6000*
4010, 1962 (Good)	3900
3020, 1964 (Fair)	3625
3020, ldr., 1967 (Fair)	4425
3010 diesel,	3300
3010 diesel, 1963 (Fair)	3570
2510	3700
2510, 1966 (Fair)	4000*
2030, 1975 (Good)	5750
2010,	2350
830, 1957 (Fair)	2150
730 diesel, 1957 (Good)	1700
730 diesel, 1957 (Fair)	2000*
720, 1957 (Fair)	1750
720 diesel, 1962 (Good)	1525*
630, 1967 (Rough)	1550*
620, 1956 (Fair)	1400*
620, 1957 (Good)	1450
520,	1400
70, 1954 (Fair)	700
60,	985
50,	950
JD A, 1946 (Fair)	500

FORD TRACTORS

9700, 1980 (Excellent)	15,500*
8000, 1969 (Fair)	6500*
8000, 1968 (Fair)	5000*
7000,	6800
7000, 1972 (Good)	6000
5000, 1967 (Fair)	2900
4500, ldr., backhoe,	6800
3000,	3450
Dexta, 1958 (Fair)	1200*
Jub., 1953 (Fair)	1225
8N, 1952 (Fair)	975
8N, 1950 (Good)	1150*
8N,	1200
8N, 1950 (Fair)	1220

INTERNATIONAL HARVESTER TRACTORS

1566, (Good)	11,300*
1456, 1968 (Good)	7000*
1206 diesel, 1965 (Fair)	4750
1066, 1975 (Fair)	7800
1066, 1973 (Fair)	7750
1066, 1972 (Fair)	7750*
1066,	3050
966,	8300
806, 1966 (Fair)	3500

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Auctions *(continued)*

806, 1966 (Good)	4100*
766 diesel,	6000
706 diesel,	2550
656, 1966 (Fair)	3100*
606, Idr., 1964 (Good)	2550
606 diesel,	2250
560 diesel, plow, 1961 (Good)	1950
560 diesel,	1775
560,	1400
560, 1959 (Fair)	1300*
560, 1958 (Rough)	1150*
560, 1959 (Fair)	1800*
544, Idr., 1966 (Good)	5300
504 diesel, W. F. 3 Pt.	2600
460,	900
460, 1957 (Fair)	1375
384, Idr., 1977 (Excellent)	7100*
300, 1951 (Fair)	825
Sup. MTA, 1952 (Fair)	1000
Sup. M, (Good)	1010
Sup. M, 1952 (Fair)	974
M,	725
M, 1951 (Good)	970
H, 1947 (Fair)	475
Cub, 1946 (Fair)	725
A, cult.,	600

MASSEY-FERGUSON TRACTORS

1805, 1976 (Good)	15,500*
1135 diesel, 1966 (Fair)	2525*
1080 diesel,	4950
656, 1961 (Fair)	1775
[illegible]75, (Good)	6400
204, Idr.,	2650
200, Idr., 1959 (Rough)	2050
180 diesel,	3350
165,	3600
135, 1964 (Good)	2550
135,	3100
65,	1400
35, 1952 (Fair)	1750
35, 1959 (Rough)	1600
20, Idr.,	2500

MINNEAPOLIS-MOLINE TRACTORS

G-900, 1959 (Fair)	3200
670, 1964 (Rough)	1575

OLIVER TRACTORS

1855 turbo, 1968 (Fair)	4800*
1850, 1965 (Good)	4400
1750 diesel	3000
1750 diesel,	3600
1650,	3100
1650 diesel,	3450
1600, 1961 (Fair)	2350
1550, 1962 (Fair)	1700
1450, 1966 (Fair)	2800
770, 1953 (Fair)	700

WHITE TRACTORS

4-180, 1976 (Fair)	17,500
2-105, 1975 (Good)	11,500*

NOTES:

Prices reported are for individual sales at wholesale on "as is," "cash and carry" basis.
Prices reported are NOT averages.

Condition classifications: EXCELLENT means—Engine: in perfect condition, 400 to 600 hours of use: Rubber: 80% tread remaining, no breaks or cracks; Paint: original and bright; General Appearance: excellent.

GOOD means—Engine: good running condition; Rubber: 70% tread remaining, no breaks or cracks; Paint: original paint or a good repaint job; General Appearance: good over-all.

FAIR means—Engine: possibly in need of a minor overhaul to restore; Rubber: 60% tread remaining, some cracking evident in side walls; Paint: only fair, weathered and some rust apparent; General Appearance: worn, some dents, minor parts such as gage covers missing or broken.

ROUGH means—Engine: obviously in need of a major overhaul; Rubber: smooth; Paint: scarred, weathered, rusty, needs painting urgently; General Appearance: dents, ruptures, broken parts, loose wires, some components such as lights broken, missing or inoperative.

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Nebraska test reports
Full contents
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Implement&Tractor

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66th annual red book issue

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For addresses of manufacturers whose products are listed in this edition, refer first to advertiser's index and obtain address from advertisement. For non-advertisers and companies that do not show an address on their advertisement, refer to company name and address listing in I&T PRODUCT FILE (Annual March 31 issue).

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This section includes only those 1981 Nebraska Tests for which the printed form is available December 31, 1981. The 1981 Fall Series tests will be reproduced at a later date.

The Nebraska Tractor Test Law

Purpose of the Law—The Nebraska Tractor Test Law originated in 1919 for the purpose of verifying advertising claims on tractors offered for sale to Nebraska farmers.

Its position as the only independent test laboratory in the United States devoted to the evaluation of tractor performance proved of unique value to the industry. The Agricultural Tractor Test Code used in the Nebraska Tests was developed with the approval and assistance of the American Society of Agricultural Engineers and the Society of Automotive Engineers, and is revised and updated periodically as the need arises. The Test Code (ASAE S209.4 or SAE J708c) is published in the ASAE Yearbook and SAE Handbook.

Provisions of the Law—Stated briefly, the Nebraska Tractor Test Law provides:

That a stock unit of each agricultural tractor model sold in Nebraska shall be tested and passed upon by a board of three engineers under the supervision and direction of the University of Nebraska. Each tractor must be certified as a stock model and will be equipped with the common power consuming accessories. An official representative of the manufacturer is present during the test to see that the performance meets company standards.

The Department of Agriculture shall deny to any manufacturer the right to do business in the State on complaint of two or more bona fide customers that the company has failed to maintain an adequate service station with a full supply of replacement parts within the state and within reasonable distance of customers.

The law further states that it shall be unlawful to publish excerpts from any official test in advertising material without publishing the entire report.

The provisions of the Nebraska Test Law do not apply to any tractor the engine of which develops less than 20 horsepower; or to tractors manufactured, sold and used for heavy construction when identical units are not sold and used for agricultural purposes.

Explanation of Test Report

General

Tractors are tested at the University of Nebraska according to the Agricultural Tractor Test Code approved by the American Society of Agricultural Engineers and the Society of Automotive Engineers or official Nebraska test procedure.

The manufacturer selects the tractor to be tested and certifies that it is a stock model. Each tractor is equipped with the common power consuming accessories such as power steering, power lift pump, generator, etc., if available. Power consuming accessories may be disconnected only when the means for disconnecting can be reached from the operating station. An official representative of the company is present during the test to see that the tractor gives its optimum performance. Additional weight may be added to the tractor as ballast if the manufacturer recommends use of such ballast. The static tire loads and the tire inflation pressures must conform to the specifications of Tire and Rim Association.

Preparation for Test

The engine crankcase is drained and refilled with new oil conforming to specifications in the operator's manual. The operator's manual is also used as the guide for selecting the proper fuel and for routine lubrication and maintenance operations.

The tractor is limbered up for a minimum of three hours on the drawbar. Preliminary adjustment of the tractor is permitted at this time. Any parts added or replaced during the limber-up run, or any subsequent runs, are mentioned in the individual test reports. The tractor is equipped with approximately the amount of added ballast that is to be used during the drawbar runs.

PTO Performance

Power take-off performance runs are made by connecting the power take-off to a dynamometer. During a preliminary power take-off run the manufacturer's representative may make adjustment for the fuel, ignition or injection timing and governor control settings. These settings must be maintained for the remainder of the test. The manually operated governor control mechanism is set to provide the high-idle speed specified by the manufacturer. During the power take-off runs an ambient air temperature of approximately 75°F. (24.0°C) is maintained.

Maximum power is obtained at the rated engine speed specified by the manufacturer with the governor control lever set for maximum power. This same setting is used for all subsequent PTO runs. Time of the run is two hours. Whenever the power take-off speed during the maximum power run differs from the speeds set forth in the ASAE and SAE standards, an additional run is made at either 540 or 1000 rpm of the power take-off shaft. Time of this run is one hour.

Drawbar Performance

Maximum drawbar power is shown for the normal field speed selected by the manufacturer. All engine adjustments are the same as those used in the power take-off runs. If the manufacturer specifies a different rated engine speed for drawbar operations, then the position of the manually operated governor control is changed to provide the high-idle speed specified.

Maximum drawbar power is determined within the following limits: (1) slip of the drivers must not exceed 15% for pneumatic tires on the concrete test course or 7% for steel cleats on the well packed earthen test course, (2) ground speeds must not exceed 10 miles per hour, (3) safe stability limits of the tractor must not be exceeded, (4) no other operating limit of the tractor must be exceeded. Drawbar load is applied until the manufacturer's rated engine speed is obtained with maximum governor control lever setting. Travel speed, drawbar pull and other data are recorded over two 500-foot straight level areas.

Fuel consumption is determined at the manufacturer's selected travel speed with the drawbar pull set: (1) to give rated engine rpm, (2) 75% of the pull at rated engine rpm, (3) 50% of the pull at rated engine rpm, and (4) maintaining the same load and travel speed as in (3) by shifting to a higher gear and reducing the engine rpm.

This summary shows the drawbar horsepower, corresponding travel speed and fuel consumption at 100%, 75% or 50% loads, and 50% of pull at reduced engine speed.

Also shown is the maximum drawbar horsepower produced for two 500-foot travel sections and corresponding travel speed, the maximum drawbar pull and the corresponding drive-wheel slippage.

In addition, the "lugging ability" obtained by increasing the load so that the full throttle engine speed drops to 80% of rated is given as a percent increase with respect to the pull at rated engine rpm.

The maximum drawbar horsepower and the corresponding speed and drawbar pull for other selected gears or travel speeds are shown in the individual test reports.

Sound Measurement

Sound is recorded during each of the Drawbar Performance runs as the tractor travels on a straight section of the test course. The dB(A) sound level is obtained with the microphone located near the right ear of the operator. Bystander sound readings are taken with the microphone placed 25 feet (7.5 m) from the line of travel of the tractor. An increase of 10dB(A) will approximately double the loudness to the human ear.

Individual copies of any test report, annual summary booklets or annual subscription (at $4.50) are available. For complete information write to **Department of Agricultural Engineering, Univ. of Nebraska — Lincoln, Lincoln, NE 68583.**

NEBRASKA TRACTOR TEST 1357 — JOHN DEERE 4440 POWER SHIFT DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—1010 rpm)									
	130.41 *(97.25)*	2200	8.508 *(32.206)*	0.461 *(0.280)*	15.32 *(3.020)*	191 *(88.5)*	65 *(18.3)*	76 *(24.3)*	29.013 *(97.974)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	114.04 *(85.04)*	2262	7.862 *(29.761)*	0.487 *(0.296)*	14.50 *(2.857)*	189 *(86.9)*	65 *(18.3)*	76 *(24.2)*	....
	0.00 *(0.00)*	2346	2.884 *(10.917)*	....	....	177 *(80.6)*	65 *(18.1)*	75 *(23.6)*	....
	58.13 *(43.35)*	2310	5.356 *(20.275)*	0.651 *(0.396)*	10.85 *(2.138)*	185 *(84.7)*	64 *(17.8)*	75 *(23.6)*	....
	130.53 *(97.34)*	2199	8.520 *(32.252)*	0.461 *(0.281)*	15.32 *(3.018)*	193 *(89.2)*	64 *(17.8)*	75 *(23.9)*	....
	29.26 *(21.82)*	2326	4.133 *(15.645)*	0.998 *(0.607)*	7.08 *(1.395)*	179 *(81.7)*	65 *(18.1)*	75 *(23.9)*	....
	86.50 *(64.50)*	2286	6.609 *(25.018)*	0.540 *(0.328)*	13.09 *(2.578)*	187 *(86.1)*	65 *(18.1)*	75 *(23.9)*	....
Av ***Av***	**69.74** ***(52.01)***	**2288**	**5.894** ***(22.311)***	**0.597** ***(0.363)***	**11.83** ***(2.331)***	**185** ***(84.9)***	**64** ***(18.0)***	**75** ***(23.8)***	**29.020** ***(97.996)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom inch Hg *(kPa)*
Maximum Available Power—Two Hours 4th Gear											
111.23 *(82.95)*	9212 *(40.98)*	4.53 *(7.29)*	2200	6.69	8.460 *(32.023)*	0.537 *(0.327)*	13.15 *(2.590)*	194 *(90.0)*	73 *(22.8)*	85 *(29.2)*	28.945 *(97.743)*
75% of Pull at Maximum Power—Ten Hours 4th Gear											
90.52 *(67.50)*	7093 *(31.55)*	4.79 *(7.70)*	2285	5.13	7.408 *(28.044)*	0.578 *(0.352)*	12.22 *(2.407)*	186 *(85.7)*	61 *(16.3)*	64 *(17.9)*	29.041 *(98.067)*
50% of Pull at Maximum Power—Two Hours 4th Gear											
62.26 *(46.43)*	4733 *(21.05)*	4.93 *(7.94)*	2305	3.03	5.876 *(22.242)*	0.667 *(0.405)*	10.60 *(2.087)*	189 *(87.2)*	77 *(24.7)*	91 *(32.8)*	28.935 *(97.709)*
50% of Pull at Reduced Engine Speed—Two Hours 6th Gear											
62.14 *(46.34)*	4730 *(21.04)*	4.93 *(7.93)*	1364	2.95	4.389 *(16.614)*	0.499 *(0.303)*	14.16 *(2.789)*	187 *(86.1)*	73 *(22.8)*	81 *(26.9)*	28.930 *(97.692)*
MAXIMUM POWER IN SELECTED GEARS											
81.38 *(60.68)*	13738 *(61.11)*	2.22 *(3.58)*	2276	13.48	2nd Gear			184 *(84.2)*	67 *(19.4)*	70 *(21.1)*	28.950 *(97.760)*
109.86 *(81.92)*	12172 *(54.14)*	3.38 *(5.45)*	2199	10.08	3rd Gear			192 *(88.9)*	71 *(21.7)*	76 *(24.4)*	28.960 *(97.794)*
114.16 *(85.13)*	9449 *(42.03)*	4.53 *(7.29)*	2200	6.69	4th Gear			193 *(89.2)*	69 *(20.6)*	74 *(23.3)*	28.960 *(97.794)*
112.11 *(83.60)*	6948 *(30.90)*	6.05 *(9.74)*	2199	4.86	5th Gear			194 *(89.7)*	72 *(22.2)*	78 *(25.6)*	28.950 *(97.760)*
112.20 *(83.67)*	5320 *(23.67)*	7.91 *(12.73)*	2201	3.49	6th Gear			193 *(89.4)*	72 *(22.2)*	80 *(26.7)*	28.950 *(97.760)*

LUGGING ABILITY IN 4th GEAR

Crankshaft Speed rpm	2200	1982	1750	1545	1314	1093
Pull—lbs *(kN)*	9449 *(42.03)*	10755 *(47.84)*	11915 *(53.00)*	12706 *(56.52)*	12584 *(55.98)*	11242 *(50.01)*
Increase in Pull %	0	14	26	34	33	19
Power—Hp *(kW)*	114.16 *(85.13)*	115.53 *(86.15)*	111.16 *(82.89)*	102.88 *(76.72)*	86.77 *(64.70)*	65.94 *(49.17)*
Speed—Mph *(km/h)*	4.53 *(7.29)*	4.03 *(6.48)*	3.50 *(5.63)*	3.04 *(4.89)*	2.59 *(4.16)*	2.20 *(3.54)*
Slip %	6.69	7.89	9.54	10.87	10.87	8.86

Department of Agricultural Engineering

Dates of Test: August 18-29, 1980, Cab sound test No. 80-6, November 20, 1980

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, P.O. Box 270, Waterloo, Iowa 50704

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8482 **Fuel weight** 7.063 lbs/gal *(0.846 kg/l)* **Oil SAE** 30 **API service classification** CD, CC and SD **To motor** 4.377 gal *(16.569 l)* **Drained from motor** 3.847 gal *(14.562 l)* **Transmission and final drive lubricant** John Deere Hy-Gard **Total time engine was operated** 37.0 hours

ENGINE: Make John Deere Diesel **Type** six cylinder vertical with turbocharger **Serial No.** 6466TR-04 139264RG **Crankshaft** lengthwise **Rated rpm** 2200 **Bore and stroke** 4.56″ × 4.75″ *(115.9 mm × 120.7 mm)* **Compression ratio** 15.8 to 1 **Displacement** 466 cu in *(7636 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with dust evacuator **Oil filter** one paper cartridge **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for transmission and hydraulic oil **Fuel filter** two paper cartridges **Muffler** vertical **Cooling medium temperature control** two thermostats.

CHASSIS: Type standard with duals **Serial No.** 4440P-041136R **Tread width** rear 60″ *(1524 mm)* to 130″ *(3302 mm)* front 56″ *(1422 mm)* to 82″ *(2083 mm)* **Wheel base** 106.6″ *(2709 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 32.5″ *(826 mm)* Vertical distance above roadway 39.9″ *(1014 mm)* Horizontal distance from center of rear wheel tread 0.3″ *(7.5 mm)* to the left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with full range power shift **Advertised speeds mph *(km/h)*** first 1.8 *(2.7)* second 2.5 *(4.0)* third 3.8 *(6.1)* fourth 4.9 *(8.0)* fifth 6.4 *(10.5)* sixth 8.2 *(13.7)* seventh 11.0 *(17.5)* eighth 18.6 *(29.8)* reverse 2.2 *(3.6)*, 3.0 *(5.1)*, 4.6 *(7.6)*, 5.9 *(9.8)* **Clutch** wet multiple disc hydraulically power actuated and operated by foot pedal **Brakes** wet disc hydraulically power actuated and operated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 146″ *(3.71 m)* left 146″ *(3.71 m)* (on concrete surface without brake applied) right 163″ *(4.14 m)* left 163″ *(4.14 m)* **Turning space diameter** (on concrete surface with brake applied) right 302″ *(7.67 m)* left 302″ *(7.67 m)* (on concrete surface without brake) right 338″ *(8.58 m)* left 338″ *(8.58 m)* **Power take-off** 1010 rpm at 2200 engine rpm and 540 rpm at 2182 engine rpm.

TRACTOR SOUND LEVEL	With Cab dB(A)	W/O Cab dB(A)
Maximum Available Power—Two Hours	77.0	93.5
75% of Pull at Maximum Power—Ten Hours	77.0	93.0
50% of Pull at Maximum Power—Two Hours	77.5	93.0
50% of Pull at Reduced Engine Speed—Two Hours	74.5	89.0
Bystander in 8th gear	87.0	85.0

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Four 18.4-38; 6; 12 *(85)*	Four 18.4-38; 6; 12 *(85)*
Ballast	—Liquid (each inner)	1328 lb *(602 kg)*	None
	—Cast Iron (each)	None	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 11.00-16; 8; 40 *(275)*	Two 11.00-16; 8; 40 *(275)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	None	None
Height of Drawbar		22.5 in *(570 mm)*	22.5 in *(570 mm)*
Static Weight with Operator	—Rear	12125 lb *(5500 kg)*	9470 lb *(4296 kg)*
	—Front	3650 lb *(1656 kg)*	3650 lb *(1656 kg)*
	—Total	15775 lb *(7156 kg)*	13120 lb *(5952 kg)*

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump return was 150°F *(65.6°C)*. Five gears were chosen between stability limit and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1357.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers

John Deere 4440 Power Shift Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1358 — JOHN DEERE 4640 POWER SHIFT DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption			Temperature °F *(°C)*			Barometer inch Hg *(kPa)*
		gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—1015 rpm)								
155.96 *(116.30)*	2200	9.942 *(37.635)*	0.450 *(0.274)*	15.68 *(3.090)*	192 *(88.9)*	62 *(16.8)*	75 *(23.9)*	28.960 *(97.794)*
Standard Power Take-off Speed (1000 rpm)—One Hour								
157.01 *(117.08)*	2167	9.894 *(37.453)*	0.445 *(0.271)*	15.87 *(3.126)*	192 *(88.8)*	61 *(16.2)*	75 *(23.9)*	28.965 *(97.810)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
137.51 *(102.54)*	2281	9.336 *(35.341)*	0.480 *(0.292)*	14.73 *(2.901)*	189 *(87.2)*	62 *(16.4)*	75 *(23.9)*	....
0.00 *(0.00)*	2380	3.190 *(12.075)*	....	....	178 *(81.1)*	62 *(16.4)*	75 *(23.9)*	....
70.17 *(52.33)*	2331	6.261 *(23.700)*	0.630 *(0.383)*	11.21 *(2.208)*	185 *(85.0)*	62 *(16.7)*	75 *(23.9)*	....
157.16 *(117.19)*	2200	10.007 *(37.881)*	0.450 *(0.274)*	15.70 *(3.094)*	193 *(89.4)*	62 *(16.7)*	76 *(24.2)*	....
35.39 *(26.39)*	2351	4.821 *(18.249)*	0.962 *(0.585)*	7.34 *(1.446)*	179 *(81.7)*	62 *(16.7)*	75 *(23.9)*	....
104.32 *(77.79)*	2310	7.849 *(29.712)*	0.531 *(0.323)*	13.29 *(2.618)*	188 *(86.7)*	62 *(16.7)*	75 *(23.9)*	....
Av 84.09 ***Av (62.71)***	**2309**	**6.911** ***(26.161)***	**0.580** ***(0.353)***	**12.17** ***(2.397)***	**185** ***(85.2)***	**62** ***(16.6)***	**75** ***(23.9)***	**28.947** ***(97.749)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F *(°C)*			Barom inch Hg *(kPa)*
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 4th Gear											
132.44 *(98.76)*	10368 *(46.12)*	4.79 *(7.71)*	2198	7.55	9.787 *(37.047)*	0.522 *(0.317)*	13.53 *(2.666)*	196 *(90.8)*	66 *(18.6)*	80 *(26.4)*	29.075 *(98.182)*
75% of Pull at Maximum Power—Ten Hours 4th Gear											
109.02 *(81.30)*	8008 *(35.62)*	5.11 *(8.22)*	2290	5.36	8.690 *(32.894)*	0.563 *(0.342)*	12.55 *(2.472)*	194 *(89.8)*	68 *(20.2)*	85 *(29.6)*	28.997 *(97.919)*
50% of Pull at Maximum Power—Two Hours 4th Gear											
74.76 *(55.75)*	5334 *(23.73)*	5.26 *(8.46)*	2318	3.81	6.938 *(26.262)*	0.655 *(0.399)*	10.78 *(2.123)*	190 *(87.8)*	67 *(19.2)*	82 *(27.5)*	29.050 *(98.097)*
50% of Pull at Reduced Engine Speed—Two Hours 6th Gear											
74.47 *(55.53)*	5306 *(23.60)*	5.26 *(8.47)*	1353	3.69	5.221 *(19.763)*	0.495 *(0.301)*	14.26 *(2.810)*	191 *(88.3)*	66 *(18.6)*	84 *(28.9)*	29.035 *(98.047)*
MAXIMUM POWER IN SELECTED GEARS											
96.94 *(72.28)*	15989 *(71.12)*	2.27 *(3.66)*	2306	14.86		2nd Gear		187 *(86.1)*	65 *(18.3)*	76 *(24.4)*	28.870 *(97.490)*
131.38 *(97.97)*	13935 *(61.99)*	3.54 *(5.69)*	2201	11.36		3rd Gear		196 *(91.1)*	64 *(17.8)*	77 *(25.0)*	29.080 *(98.199)*
137.04 *(102.19)*	10694 *(47.57)*	4.81 *(7.73)*	2201	7.32		4th Gear		195 *(90.3)*	63 *(17.2)*	73 *(22.8)*	29.050 *(98.097)*
134.77 *(100.50)*	7798 *(34.69)*	6.48 *(10.43)*	2202	5.25		5th Gear		193 *(89.4)*	66 *(18.9)*	78 *(25.6)*	28.870 *(97.490)*
134.62 *(100.39)*	5924 *(26.35)*	8.52 *(13.71)*	2198	3.97		6th Gear		194 *(90.0)*	67 *(19.4)*	80 *(26.7)*	28.870 *(97.490)*

LUGGING ABILITY IN 4th GEAR

Crankshaft Speed rpm	2201	1966	1754	1546	1320	1090
Pull—lbs *(kN)*	10694 *(47.57)*	12063 *(53.66)*	12991 *(57.79)*	13747 *(61.15)*	13795 *(61.36)*	11799 *(52.48)*
Increase in Pull %	0	13	21	29	29	10
Power—Hp *(kW)*	137.04 *(102.19)*	136.35 *(101.68)*	129.54 *(96.60)*	119.45 *(89.07)*	102.11 *(76.15)*	73.91 *(55.12)*
Speed—Mph *(km/h)*	4.81 *(7.73)*	4.24 *(6.82)*	3.74 *(6.02)*	3.26 *(5.24)*	2.78 *(4.47)*	2.35 *(3.78)*
Slip %	7.32	8.59	9.46	10.59	10.73	8.44

Department of Agricultural Engineering

Dates of Test: August 18-28, 1980, Cab sound test No. 80-4 November 19, 1980

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, P.O. Box 270, Waterloo, Iowa 50704

FUEL, OIL AND TIME: **Fuel** No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** ***(15°/15°)*** 0.8482 **Fuel weight** 7.063 lbs/gal *(0.846 kg/l)* **Oil SAE** 30 **API service classification** CD, CC and SD **To motor** 5.662 gal *(21.431 l)* **Drained from motor** 5.484 gal *(20.757 l)* **Transmission and final drive lubricant** John Deere Hy-Gard **Total time engine was operated** 36.0 hours

ENGINE: **Make** John Deere Diesel **Type** six cylinder vertical with turbocharger and intercooler **Serial No.** 6466AR-08 139316RG **Crankshaft** lengthwise **Rated rpm** 2200 **Bore and stroke** 4.56" × 4.75" *(115.8 mm × 120.7 mm)* **Compression ratio** 15.0 to 1 **Displacement** 466 cu in *(7636 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements **Oil filter** one paper cartridge **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for transmission and hydraulic oil **Fuel filter** two snap-on paper cartridges **Muffler** vertical **Cooling medium temperature control** two thermostats.

CHASSIS: **Type** standard with duals **Serial No.** 4640P-18823R **Tread width** rear 60" *(1524 mm)* to 131.6" *(3342 mm)* front 60.8" *(1543 mm)* to 84.9" *(2156 mm)* **Wheel base** 118.5" *(3009 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 33.0" *(838 mm)* Vertical distance above roadway 43.5" *(1106 mm)* Horizontal distance from center of rear wheel tread 0.2" *(6 mm)* to the left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with full range power shift **Advertised speeds mph** ***(km/h)*** first 1.8 *(2.9)* second 2.6 *(4.1)* third 4.0 *(6.4)* fourth 5.2 *(8.4)* fifth 6.8 *(11.0)* sixth 8.9 *(14.3)* seventh 11.4 *(18.3)* eighth 19.5 *(31.3)* reverse 2.3 *(3.7)*, 3.3 *(5.3)*, 5.1 *(8.2)*, 6.7 *(10.7)* **Clutch** wet multiple disc hydraulically power actuated and operated by foot pedal **Brakes** wet disc hydraulically power actuated and operated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 161" *(4.09 m)* left 161" *(4.09 m)* (on concrete surface without brake applied) right 182" *(4.62 m)* left 182" *(4.62 m)* **Turning space diameter** (on concrete surface with brake applied) right 336" *(8.53 m)* left 336" *(8.53 m)* (on concrete surface without brake) right 377" *(9.58 m)* left 377" *(9.58 m)* **Power take-off** 1000 rpm at 2167 engine rpm

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

TRACTOR SOUND LEVEL	With Cab dB(A)	W/O Cab dB(A)
Maximum Available Power—Two Hours	77.0	94.5
75% of Pull at Maximum Power—Ten Hours	78.0	95.0
50% of Pull at Maximum Power—Two Hours	77.5	96.0
50% of Pull at Reduced Engine Speed—Two Hours	75.5	90.0
Bystander in 8th gear	87.5	86.5

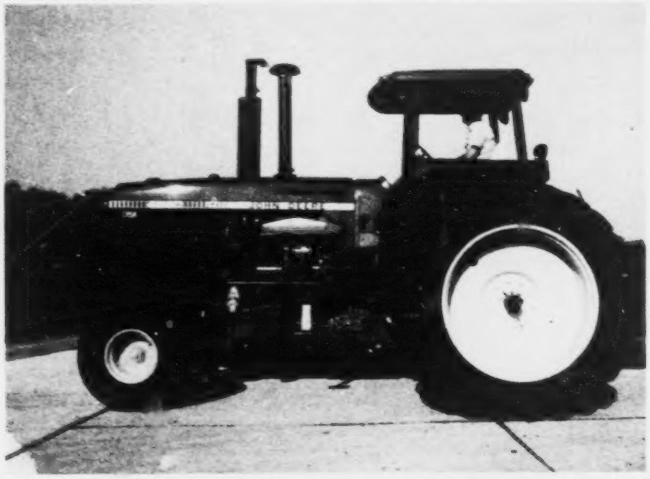
TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Four 18.4-42; 10; 14 *(95)*	Four 18.4-42; 10; 14 *(95)*
Ballast	—Liquid (each inner)	None	None
	—Cast Iron (each)	686 lb *(311 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 14L-16.1; 10; 44 *(305)*	Two 14L-16.1; 10; 44 *(305)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	30 lb *(14 kg)*	None
Height of Drawbar		24 in *(610 mm)*	24 in *(610 mm)*
Static Weight with Operator	—Rear	14175 lb *(6430 kg)*	11430 lb *(5185 kg)*
	—Front	4410 lb *(2000 kg)*	4350 lb *(1973 kg)*
	—Total	18585 lb *(8430 kg)*	15780 lb *(7158 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump return was 154°F *(67.8°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1358.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers



John Deere 4640 Power Shift Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska-Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1359 —
JOHN DEERE 4040 SYNCRO RANGE DIESEL
8 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption			Temperature °F (°C)			Barometer inch Hg (kPa)
			gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—1002 rpm)									
	90.31 (67.34)	2200	6.512 (24.652)	0.503 (0.306)	13.87 (2.732)	193 (89.6)	70 (21.0)	75 (23.8)	28.937 (97.715)
VARYING POWER AND FUEL CONSIMPTION—Two Hours									
	79.12 (59.00)	2266	5.814 (22.006)	0.513 (0.312)	13.61 (2.681)	190 (87.8)	69 (20.6)	75 (23.9)	....
	0.00 (0.00)	2356	2.419 (9.157)	....	....	181 (82.8)	69 (20.3)	71 (23.1)	....
	40.56 (30.25)	2323	4.000 (15.142)	0.689 (0.419)	10.14 (1.998)	187 (85.8)	69 (20.6)	74 (23.3)	....
	90.66 (67.61)	2200	6.527 (24.706)	0.503 (0.306)	13.89 (2.736)	194 (90.0)	69 (20.6)	75 (23.9)	....
	20.32 (15.15)	2342	3.201 (12.117)	1.100 (0.669)	6.35 (1.250)	182 (83.3)	70 (20.8)	76 (24.2)	....
	59.96 (44.71)	2294	4.825 (18.265)	0.562 (0.342)	12.43 (2.448)	189 (87.2)	70 (21.1)	75 (23.9)	....
Av ***Av***	**48.44** ***(36.12)***	**2297**	**4.464** ***(16.899)***	**0.644** ***(0.391)***	**10.85** ***(2.137)***	**187** ***(86.2)***	**69** ***(20.7)***	**75** ***(23.7)***	**28.947** ***(97.749)***

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F (°C)			Barom. inch Hg (kPa)
					gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 4th Gear											
73.83 (55.05)	5716 (25.43)	4.84 (7.80)	2199	7.31	6.320 (23.923)	0.598 (0.364)	11.68 (2.301)	200 (93.3)	73 (22.8)	87 (30.3)	29.025 (98.013)
75% of Pull at Maximum Power—Ten Hours 4th Gear											
60.45 (45.08)	4437 (19.74)	5.11 (8.22)	2266	5.16	5.357 (20.277)	0.619 (0.376)	11.29 (2.223)	193 (89.6)	74 (23.5)	89 (31.4)	28.934 (97.706)
50% of Pull at Maximum Power—Two Hours 4th Gear											
42.02 (31.34)	2974 (13.23)	5.30 (8.53)	2307	3.38	4.333 (16.401)	0.720 (0.438)	9.70 (1.911)	191 (88.3)	75 (23.9)	95 (35.0)	29.000 (97.929)
50% of Pull at Reduced Engine Speed—Two Hours 6th Gear											
41.87 (31.23)	2962 (13.18)	5.30 (8.53)	1418	3.20	3.187 (12.063)	0.531 (0.323)	13.14 (2.589)	195 (90.3)	74 (23.3)	97 (36.1)	28.965 (97.810)
MAXIMUM POWER IN SELECTED GEARS											
64.76 (48.29)	9035 (40.19)	2.69 (4.33)	2262	14.80		2nd Gear		190 (87.5)	67 (19.4)	71 (21.7)	28.990 (97.895)
74.02 (55.20)	7616 (33.88)	3.64 (5.87)	2199	10.46		3rd Gear		195 (90.3)	70 (21.1)	78 (25.6)	29.010 (97.962)
76.42 (56.99)	5916 (26.32)	4.84 (7.80)	2200	7.38		4th Gear		193 (89.2)	68 (20.0)	75 (23.9)	29.010 (97.962)
76.85 (57.39)	4691 (20.87)	6.14 (9.89)	2200	5.79		5th Gear		194 (90.0)	71 (21.7)	80 (26.7)	29.020 (97.996)
77.04 (57.45)	3548 (15.78)	8.14 (13.11)	2200	4.23		6th Gear		194 (90.0)	72 (22.2)	82 (27.8)	29.030 (98.030)

LUGGING ABILITY IN 4th GEAR

Crankshaft Speed rpm	2200	1983	1756	1537	1316	1093
Pull—lbs (kN)	5916 (26.32)	6391 (28.43)	6558 (29.17)	6783 (30.17)	6864 (30.53)	6697 (29.79)
Increase in Pull %	0	8	11	15	16	13
Power—Hp (kW)	76.42 (56.99)	73.86 (55.08)	66.94 (49.92)	60.35 (45.00)	52.18 (38.91)	42.40 (31.61)
Speed—Mph (km/h)	4.84 (7.80)	4.33 (6.97)	3.83 (6.16)	3.34 (5.37)	2.85 (4.59)	2.37 (3.82)
Slip %	7.38	8.12	8.38	8.78	8.91	8.78

Department of Agricultural Engineering

Dates of Test: August 20 to September 9, 1980

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, P.O. Box 270, Waterloo, Iowa 50704

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8386 **Fuel weight** 6.982 lbs/gal *(0.837 kg/l)* **Oil SAE** 30 **API service classification** CD, CC and SD **To motor** 3.862 gal *(14.618 l)* **Drained from motor** 3.694 gal *(13.982 l)* **Transmission and final drive lubricant** John Deere Hy-Gard **Total time engine was operated** 31.5 hours

ENGINE: Make John Deere Diesel **Type** six cylinder vertical **Serial No.** 6404DR-25 582939RG **Crankshaft** lengthwise **Rated rpm** 2200 **Bore and stroke** 4.25" × 4.75" *(108 mm × 120.6 mm)* **Compression ratio** 16.6 to 1 **Displacement** 404 cu in *(6620 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with dust evacuator **Oil filter** one full flow cartridge **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for transmission and hydraulic oil **Fuel filter** one paper element **Muffler** vertical **Cooling medium temperature control** two thermostats.

CHASSIS: Type standard **Serial No.** 4040W-008515R **Tread width** rear 60" *(1524 mm)* to 90" *(2286 mm)* front 56" *(1422 mm)* to 82" *(2083 mm)* **Wheel base** 104" *(2641 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 31.3" *(795 mm)* Vertical distance above roadway 38.2" *(971 mm)* Horizontal distance from center of rear wheel tread 0.1" *(2.0 mm)* to the left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.9 *(3.1)* second 3.0 *(4.8)* third 4.0 *(6.4)* fourth 5.1 *(8.2)* fifth 6.3 *(10.2)* sixth 8.3 *(13.4)* seventh 10.7 *(17.3)* eighth 17.5 *(28.2)* reverse 3.8 *(6.3)*, 6.2 *(10.0)* **Clutch** wet multiple disc hydraulically power actuated and operated by foot pedal **Brakes** wet disc hydraulically power actuated and operated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 143" *(3.63 m)* left 143" *(3.63 m)* (on concrete surface without brake) right 158.5" *(4.03 m)* left 158.5" *(4.03 m)* **Turning space diameter** (on concrete surface with brake applied) right 295.8" *(7.51 m)* left 295.8" *(7.51 m)* (on concrete surface without brake) right 326.9" *(8.30 m)* left 326.9" *(8.30 m)* **Power take-off** 1002 rpm at 2200 engine rpm and 540 rpm at 2200 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	95.5
75% of Pull at Maximum Power—Ten Hours	96.5
50% of Pull at Maximum Power—Two Hours	94.0
50% of Pull at Reduced Engine Speed—Two Hours	90.0
Bystander in 8th gear	89.0

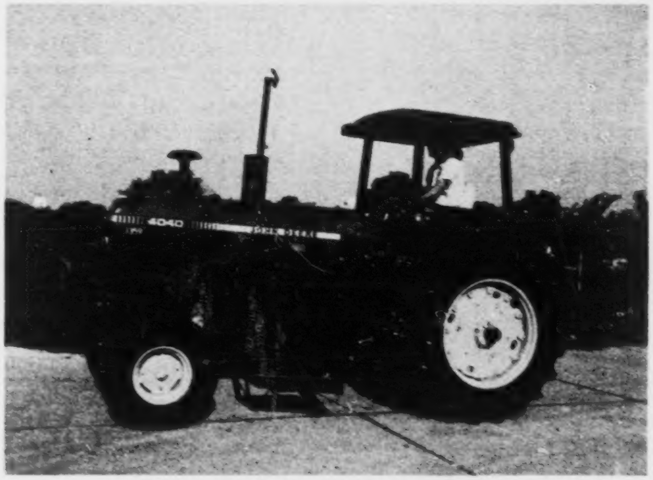
TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 18.4-34; 8; 20 *(140)*	Two 18.4-34; 8; 20 *(140)*
Ballast	—Liquid (each)	770 lb *(349 kg)*	None
	—Cast Iron (each)	None	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 10.00-16; 6; 32 *(220)*	Two 10.00-16; 6; 32 *(220)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	30 lb *(14 kg)*	None
Height of Drawbar		18.5 in *(470 mm)*	18.5 in *(470 mm)*
Static Weight with Operator	—Rear	8930 lb *(4051 kg)*	7390 lb *(3352 kg)*
	Front	3160 lb *(1433 kg)*	3100 lb *(1406 kg)*
	Total	12090 lb *(5484 kg)*	10490 lb *(4758 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump return was 152°F *(66.7°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1359**.

LOUIS I. LEVITICUS
Engineer-in Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers



John Deere 4040 Syncro Range Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1360 — JOHN DEERE 4040 POWER SHIFT DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption			Temperature °F *(°C)*			Barometer inch Hg *(kPa)*
			gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—1011 rpm)									
	90.79 *(67.70)*	2200	6.745 *(25.533)*	0.519 *(0.316)*	13.46 *(2.651)*	194 *(90.1)*	68 *(20.1)*	75 *(23.9)*	29.020 *(97.996)*
Standard Power Take-off Speed (1000 rpm)—One Hour									
	90.88 *(67.77)*	2177	6.712 *(25.406)*	0.516 *(0.314)*	13.54 *(2.667)*	194 *(90.1)*	68 *(20.0)*	75 *(23.9)*	29.035 *(98.047)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	79.56 *(59.33)*	2268	5.908 *(22.364)*	0.519 *(0.315)*	13.47 *(2.653)*	190 *(87.5)*	68 *(19.7)*	75 *(23.6)*	....
	0.00 *(0.00)*	2349	2.368 *(8.962)*	....	....	177 *(80.6)*	68 *(20.0)*	75 *(23.6)*	....
	40.55 *(30.24)*	2320	3.983 *(15.077)*	0.686 *(0.417)*	10.18 *(2.006)*	186 *(85.3)*	68 *(19.7)*	75 *(23.9)*	....
	91.11 *(67.94)*	2200	6.759 *(25.585)*	0.518 *(0.315)*	13.48 *(2.655)*	195 *(90.3)*	68 *(19.7)*	75 *(23.9)*	....
	20.42 *(15.23)*	2334	3.167 *(11.987)*	1.083 *(0.659)*	6.45 *(1.271)*	179 *(81.7)*	68 *(19.7)*	76 *(24.2)*	....
	60.20 *(44.89)*	2294	4.855 *(18.379)*	0.563 *(0.343)*	12.40 *(2.442)*	189 *(86.9)*	68 *(19.7)*	75 *(23.9)*	....
Av ***Av***	**48.64** ***(36.27)***	**2294**	**4.507** ***(17.059)***	**0.647** ***(0.394)***	**10.79** ***(2.126)***	**186** ***(85.4)***	**68** ***(19.8)***	**75** ***(23.8)***	**29.037** ***(98.052)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F *(°C)*			Barom. inch Hg *(kPa)*
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 4th Gear											
76.56 *(57.09)*	6464 *(28.75)*	4.44 *(7.15)*	2200	8.59	6.660 *(25.211)*	0.607 *(0.369)*	11.50 *(2.265)*	192 *(88.6)*	53 *(11.7)*	63 *(16.9)*	29.265 *(98.824)*
75% of Pull at Maximum Power—Ten Hours 4th Gear											
62.81 *(46.84)*	4959 *(22.06)*	4.75 *(7.64)*	2289	6.07	5.536 *(20.955)*	0.615 *(0.374)*	11.35 *(2.235)*	191 *(88.2)*	57 *(13.7)*	68 *(20.2)*	29.189 *(98.567)*
50% of Pull at Maximum Power—Two Hours 4th Gear											
43.07 *(32.12)*	3309 *(14.72)*	4.88 *(7.86)*	2308	4.25	4.512 *(17.078)*	0.731 *(0.445)*	9.55 *(1.881)*	187 *(85.8)*	54 *(12.2)*	64 *(17.8)*	29.265 *(98.824)*
50% of Pull at Reduced Engine Speed—Two Hours 6th Gear											
43.12 *(32.15)*	3307 *(14.71)*	4.89 *(7.87)*	1368	4.14	3.402 *(12.876)*	0.551 *(0.335)*	12.68 *(2.497)*	189 *(86.9)*	57 *(13.9)*	68 *(19.7)*	29.240 *(98.739)*
MAXIMUM POWER IN SELECTED GEARS											
52.67 *(39.28)*	9195 *(40.90)*	2.15 *(3.46)*	2297	14.76		2nd Gear		184 *(84.2)*	56 *(13.3)*	61 *(16.1)*	29.230 *(98.705)*
74.52 *(55.57)*	8576 *(38.15)*	3.26 *(5.24)*	2202	13.24		3rd Gear		191 *(88.3)*	56 *(13.3)*	61 *(16.1)*	29.260 *(98.807)*
78.54 *(58.57)*	6620 *(29.45)*	4.45 *(7.16)*	2200	8.39		4th Gear		192 *(88.6)*	55 *(12.8)*	60 *(15.6)*	29.240 *(98.739)*
75.84 *(56.55)*	4770 *(21.22)*	5.96 *(9.59)*	2200	6.00		5th Gear		191 *(88.3)*	56 *(13.3)*	61 *(16.1)*	29.260 *(98.807)*
75.93 *(56.62)*	3633 *(16.16)*	7.84 *(12.61)*	2201	4.36		6th Gear		191 *(88.3)*	56 *(13.3)*	62 *(16.7)*	29.270 *(98.840)*

LUGGING ABILITY IN 4th GEAR

Crankshaft Speed rpm	2200	1981	1758	1546	1314	1092	871
Pull—lbs *(kN)*	6620 *(29.45)*	7177 *(31.66)*	7354 *(32.71)*	7580 *(33.72)*	7625 *(33.92)*	7832 *(34.84)*	7774 *(34.58)*
Increase in Pull %	0	8	11	15	15	18	17
Power—Hp *(kW)*	78.54 *(58.57)*	75.42 *(56.24)*	68.70 *(51.23)*	62.04 *(46.26)*	52.92 *(39.46)*	44.96 *(33.52)*	35.60 *(26.55)*
Speed—Mph *(km/h)*	4.45 *(7.16)*	3.97 *(6.40)*	3.50 *(5.64)*	3.07 *(4.94)*	2.60 *(4.19)*	2.15 *(3.46)*	1.72 *(2.76)*
Slip %	8.39	9.11	9.76	10.15	10.28	10.66	10.66

Department of Agricultural Engineering

Dates of Test: August 20 to September 11, 1980, Cab sound test No. 80-3 November 19, 1980

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, P.O. Box 270, Waterloo, Iowa 50704

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* **Fuel weight** 6.982 lbs/gal *(0.837 kg/l)* **Oil SAE** 30 **API service classification** CD, CC and SD **To motor** 4.396 gal *(16.639 l)* **Drained from motor** 3.973 gal *(15.039 l)* **Transmission and final drive lubricant** John Deere Hy-Gard **Total time engine was operated** 36.5 hours

ENGINE: Make John Deere Diesel **Type** six cylinder vertical **Serial No.** 6404DR-26 582887RG **Crankshaft** lengthwise **Rated rpm** 2200 **Bore and stroke** 4.25" × 4.75" *(108 mm × 120.7 mm)* **Compression ratio** 16.6 to 1 **Displacement** 404 cu in *(6620 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with dust evacuator **Oil filter** one full flow cartridge **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for transmission and hydraulic oil **Fuel filter** one paper cartridge **Muffler** vertical **Cooling medium temperature control** two thermostats.

CHASSIS: Type standard **Serial No.** 4040P-008517R **Tread width** rear 60" *(1524 mm)* to 90.0" *(2286 mm)* front 56" *(1422 mm)* to 82" *(2083 mm)* **Wheel base** 104" *(2642 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 31.3" *(794 mm)* Vertical distance above roadway 38.2" *(971 mm)* Horizontal distance from center of rear wheel tread 0.1" *(2.0 mm)* to the left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with full range power shift **Advertised speeds mph *(km/h)*** first 1.7 *(2.7)* second 2.4 *(3.9)* third 3.7 *(6.0)* fourth 4.7 *(7.6)* fifth 6.1 *(9.8)* sixth 7.9 *(12.7)* seventh 10.5 *(16.9)* eighth 17.5 *(28.2)* reverse 1.9 *(3.1)*, 2.8 *(4.5)*, 4.3 *(6.9)*, 5.5 *(8.9)* **Clutch** wet multiple disc hydraulically power actuated and operated by foot pedal **Brakes** wet disc hydraulically power actuated and operated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 143" *(3.63 m)* left 143" *(3.63 m)* (on concrete surface without brake) right 158.5" *(4.03 m)* left 158.5" *(4.03 m)* **Turning space diameter** (on concrete surface with brake applied) right 295.8" *(7.51 m)* left 295.8" *(7.51 m)* (on concrete surface without brake) right 326.9" *(8.30 m)* left 326.9" *(8.30 m)* **Power take-off** 1000 rpm at 2177 engine rpm and 540 rpm at 2182 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

TRACTOR SOUND LEVEL	With Cab dB(A)	W/O Cab dB(A)
Maximum Available Power—Two Hours	78.0	95.5
75% of Pull at Maximum Power—Ten Hours	77.5	95.5
50% of Pull at Maximum Power—Two Hours	77.0	95.5
50% of Pull at Reduced Engine Speed—Two Hours	75.5	90.0
Bystander in 8th gear	90.5	90.5

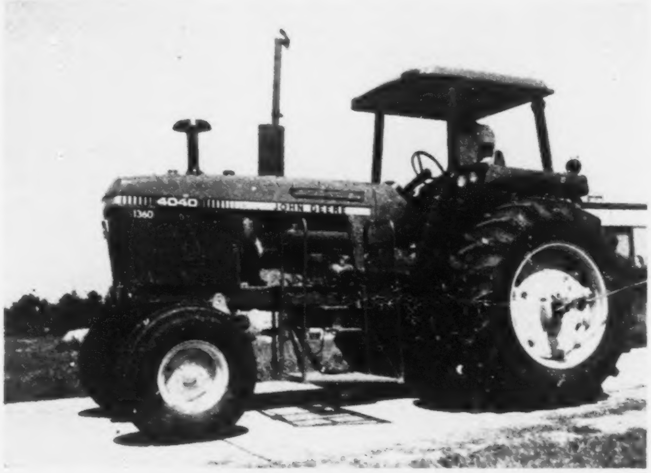
TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 18.4-34; 8; 20 *(140)*	Two 18.4-34; 8; 20 *(140)*
Ballast	—Liquid (each)	750 lb *(340 kg)*	None
	—Cast Iron (each)	None	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 10.00-16, 6; 32 *(220)*	Two 10.00-16; 6; 32 *(220)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	45 lb *(20 kg)*	None
Height of Drawbar		18.5 in *(470 mm)*	18.5 in *(470 mm)*
Static Weight with Operator	—Rear	8930 lb *(4050 kg)*	7430 lb *(3370 kg)*
	—Front	3150 lb *(1429 kg)*	3060 lb *(1388 kg)*
	—Total	12080 lb *(5479 kg)*	10490 lb *(4758 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump return was 154°F *(67.6°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1360.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers



John Deere 4040 Power Shift Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1361 —
JOHN DEERE 4240 SYNCRO RANGE DIESEL
8 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption			Temperature °F *(°C)*			
			gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—1002 rpm)									
	110.81	2200	7.822	0.493	14.17	192	67	75	29.060
	(82.63)		*(29.608)*	*(0.300)*	*(2.791)*	*(88.8)*	*(19.4)*	*(23.9)*	*(98.131)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	98.09	2290	7.167	0.510	13.69	187	67	75	......
	(73.15)		*(27.130)*	*(0.310)*	*(2.696)*	*(86.1)*	*(19.4)*	*(23.9)*	......
	0.00	2368	2.853	.....	.....	177	67	75	......
	(0.00)		*(10.800)*	.....	.....	*(80.6)*	*(19.4)*	*(23.6)*	......
	49.95	2339	4.825	0.675	10.35	183	67	75	......
	(37.25)		*(18.266)*	*(0.410)*	*(2.039)*	*(83.9)*	*(19.4)*	*(23.6)*	......
	111.65	2200	7.867	0.492	14.19	192	68	75	......
	(83.26)		*(29.781)*	*(0.299)*	*(2.796)*	*(88.6)*	*(19.7)*	*(23.6)*	......
	25.28	2354	3.811	1.053	6.63	178	68	75	......
	(18.85)		*(14.427)*	*(0.640)*	*(1.307)*	*(81.1)*	*(20.0)*	*(23.9)*	......
	74.42	2319	5.917	0.555	12.58	185	68	75	......
	(55.49)		*(22.397)*	*(0.338)*	*(2.478)*	*(85.0)*	*(20.0)*	*(23.9)*	......
Av	**59.90**	**2312**	**5.407**	**0.630**	**11.08**	**184**	**67**	**75**	**29.047**
Av	***(44.67)***		***(20.467)***	***(0.383)***	***(2.183)***	***(84.2)***	***(19.7)***	***(23.8)***	***(98.086)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp °F *(°C)* Cooling med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 4th Gear											
93.00	7118	4.90	2201	5.97	7.752	0.582	12.00	192	73	79	29.070
(69.35)	*(31.66)*	*(7.89)*			*(29.345)*	*(0.354)*	*(2.363)*	*(88.6)*	*(22.5)*	*(26.1)*	*(98.165)*
75% of Pull at Maximum Power—Ten Hours 4th Gear											
75.33	5401	5.23	2306	4.22	6.567	0.609	11.47	186	60	76	29.066
(56.17)	*(24.03)*	*(8.42)*			*(24.858)*	*(0.370)*	*(2.259)*	*(85.6)*	*(15.7)*	*(24.7)*	*(98.152)*
50% of Pull at Maximum Power—Two Hours 4th Gear											
51.82	3611	5.38	2335	2.69	5.281	0.712	9.81	189	75	91	28.760
(38.65)	*(16.06)*	*(8.66)*			*(19.992)*	*(0.433)*	*(1.933)*	*(86.9)*	*(23.9)*	*(32.8)*	*(97.118)*
50% of Pull at Reduced Engine Speed—Two Hours 6th Gear											
51.87	3614	5.38	1436	2.73	3.778	0.508	13.73	189	76	93	28.725
(38.68)	*(16.08)*	*(8.66)*			*(14.300)*	*(0.309)*	*(2.705)*	*(87.2)*	*(24.2)*	*(33.9)*	*(97.000)*
MAXIMUM POWER IN SELECTED GEARS											
86.57	12240	2.65	2240	14.78		2nd Gear		186	61	65	29.050
(64.56)	*(54.45)*	*(4.27)*						*(85.3)*	*(16.1)*	*(18.3)*	*(98.097)*
93.19	9393	3.72	2198	8.25		3rd Gear		190	69	74	29.060
(69.49)	*(41.78)*	*(5.99)*						*(87.5)*	*(20.6)*	*(23.3)*	*(98.131)*
95.40	7305	4.90	2200	6.01		4th Gear		189	62	66	29.060
(71.14)	*(32.50)*	*(7.88)*						*(87.2)*	*(16.7)*	*(18.9)*	*(98.131)*
94.28	5696	6.21	2290	4.45		5th Gear		194	70	79	28.820
(70.31)	*(25.34)*	*(9.99)*						*(89.7)*	*(21.1)*	*(26.1)*	*(97.321)*
93.21	4266	8.19	2201	3.29		6th Gear		194	71	81	28.820
(69.51)	*(18.98)*	*(13.19)*						*(90.0)*	*(21.7)*	*(27.2)*	*(97.321)*

LUGGING ABILITY IN 4th GEAR

Crankshaft Speed rpm	2200	1981	1760	1542	1317	1092	871
Pull—lbs	7305	7936	8411	8640	8731	8752	8715
(kN)	*(32.50)*	*(35.30)*	*(37.42)*	*(38.43)*	*(38.84)*	*(38.93)*	*(38.76)*
Increase in Pull %	0	9	15	18	20	20	19
Power—Hp	95.40	92.77	86.88	77.94	67.15	55.81	44.41
(kW)	*(71.14)*	*(69.18)*	*(64.79)*	*(58.12)*	*(50.07)*	*(41.62)*	*(33.12)*
Speed—Mph	4.90	4.38	3.87	3.38	2.88	2.39	1.91
(km/h)	*(7.88)*	*(7.05)*	*(6.23)*	*(5.44)*	*(4.64)*	*(3.85)*	*(3.08)*
Slip %	6.01	6.63	7.04	7.31	7.58	7.58	7.72

Department of Agricultural Engineering

Dates of Test: August 20 to September 6, 1980

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, P.O. Box 270, Waterloo, Iowa 50704

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60° *(15°/15°)*** 0.8386 **Fuel weight** 6.982 lbs/gal *(0.837 kg/l)* **Oil SAE** 30 **API service classification** CD, CC and SD **To motor** 4.171 gal *(15.787 l)* **Drained from motor** 3.861 gal *(14.614 l)* **Transmission and final drive lubricant** John Deere Hy-Gard **Total time engine was operated** 36.0 hours

ENGINE Make John Deere Diesel **Type** six cylinder vertical **Serial No.** 6466DR-01 137422RG **Crankshaft** lengthwise **Rated rpm** 2200 **Bore and stroke** 4.56" × 4.75" *(115.8 mm × 120.6 mm)* **Compression ratio** 17.0 to 1 **Displacement** 466 cu in *(7636 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with dust evacuator **Oil filter** one full flow cartridge **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for transmission and hydraulic oil **Muffler** vertical **Cooling medium temperature control** two thermostats.

CHASSIS: Type standard with duals **Serial No.** 4240W-019552R **Tread width** rear 60" *(1524 mm)* to 118.4" *(3004 mm)* front 56" *(1422 mm)* to 82" *(2083 mm)* **Wheel base** 106.7" *(2709 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 30.1" *(765 mm)* Vertical distance above roadway 40.1" *(1019 mm)* Horizontal distance from center of rear wheel tread 0.1" *(1.0 mm)* to the left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.9 *(3.1)* second 3.1 *(4.9)* third 4.1 *(6.6)* fourth 5.2 *(8.4)* fifth 6.5 *(10.5)* sixth 8.5 *(13.7)* seventh 11.1 *(17.9)* eighth 18.1 *(29.1)* reverse 4.0 *(6.4)*, 6.3 *(10.2)* **Clutch** wet multiple disc hydraulically power actuated and operated by foot pedal **Brakes** wet disc hydraulically power actuated and operated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 143.9" *(3.66 m)* left 143.9" *(3.66 m)* (on concrete surface without brake) right 161.8" *(4.11 m)* left 161.8" *(4.11 m)* **Turning space diameter** (on concrete surface with brake applied) right 293.3" *(7.45 m)* left 293.3" *(7.45 m)* (on concrete surface without brake) right 334.6" *(8.50 m)* left 334.6" *(8.50 m)* **Power take-off** 1002 rpm at 2200 engine rpm and 540 rpm at 2200 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	96.0
75% of Pull at Maximum Power—Ten Hours	96.0
50% of Pull at Maximum Power—Two Hours	96.5
50% of Pull at Reduced Engine Speed—Two Hours	91.0
Bystander in 8th gear	90.5

TIRES, BALLAST AND WEIGHT		**With Ballast**	**Without Ballast**
Rear Tires	—No., size, ply & psi *(kPa)*	Four 18.4-34; 6; 12 *(85)*	Four 18.4-34; 6; 12 *(85)*
Ballast	—Liquid (each inner)	995 lb *(451 kg)*	None
	—Cast Iron (each)	110 lb *(50 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 10.00-16; 6; 32 *(220)*	Two 10.00-16; 6; 32 *(220)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	None	None
Height of Drawbar		21 in *(535 mm)*	21 in *(535 mm)*
Static Weight with Operator	—Rear	10830 lb *(4912 kg)*	8400 lb *(3810 kg)*
	Front	3410 lb *(1547 kg)*	3410 lb *(1547 kg)*
	Total	14240 lb *(6459 kg)*	11810 lb *(5357 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump return was 154°F *(67.7°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1361.**

LOUIS I. LEVITICUS
Engineer-in Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers

4240
JOHN DEERE

John Deere 4240 Syncro Range Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1362 — JOHN DEERE 4240 POWER SHIFT DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—1011 rpm)									
	111.06 *(82.82)*	2200	7.822 *(29.608)*	0.492 *(0.299)*	14.20 *(2.797)*	193 *(89.3)*	62 *(16.7)*	75 *(23.9)*	29.030 *(98.030)*
Standard Power Take-off Speed (1000 rpm)—One Hour									
	111.43 *(83.09)*	2176	7.744 *(29.315)*	0.485 *(0.295)*	14.39 *(2.834)*	193 *(89.4)*	62 *(16.7)*	75 *(23.9)*	29.050 *(98.097)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	97.40 *(72.63)*	2272	7.064 *(26.740)*	0.506 *(0.308)*	13.79 *(2.716)*	189 *(87.2)*	62 *(16.7)*	75 *(23.9)*	....
	0.00 *(0.00)*	2365	2.685 *(10.166)*	....	....	178 *(80.8)*	62 *(16.7)*	75 *(23.6)*	....
	49.98 *(37.37)*	2333	4.744 *(17.956)*	0.663 *(0.403)*	10.54 *(2.076)*	183 *(83.6)*	62 *(16.7)*	75 *(23.9)*	....
	111.93 *(83.47)*	2200	7.824 *(29.619)*	0.488 *(0.297)*	14.31 *(2.818)*	193 *(89.4)*	62 *(16.7)*	76 *(24.4)*	....
	25.20 *(18.79)*	2350	3.717 *(14.069)*	1.030 *(0.626)*	6.78 *(1.336)*	179 *(81.4)*	62 *(16.7)*	75 *(23.9)*	....
	74.13 *(55.28)*	2305	5.848 *(22.137)*	0.551 *(0.335)*	12.68 *(2.497)*	186 *(85.3)*	62 *(16.7)*	75 *(23.9)*	....
Av ***Av***	**59.77** ***(44.57)***	**2304**	**5.314** ***(20.114)***	**0.621** ***(0.378)***	**11.25** ***(2.216)***	**184** ***(84.6)***	**62** ***(16.7)***	**75** ***(23.9)***	**29.040** ***(98.064)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 4th Gear											
92.70 *(69.12)*	7692 *(34.21)*	4.52 *(7.27)*	2199	6.38	7.645 *(28.938)*	0.576 *(0.350)*	12.13 *(2.389)*	195 *(90.6)*	73 *(22.5)*	78 *(25.3)*	28.965 *(97.810)*
75% of Pull at Maximum Power—Ten Hours 4th Gear											
76.14 *(56.77)*	5961 *(26.51)*	4.79 *(7.71)*	2286	4.60	6.535 *(24.738)*	0.599 *(0.365)*	11.65 *(2.295)*	193 *(89.2)*	71 *(21.4)*	86 *(29.8)*	28.836 *(97.375)*
50% of Pull at Maximum Power—Two Hours 4th Gear											
52.79 *(39.36)*	4001 *(17.80)*	4.95 *(7.96)*	2323	3.09	5.210 *(19.721)*	0.689 *(0.419)*	10.13 *(1.996)*	185 *(84.7)*	73 *(22.8)*	79 *(25.8)*	28.940 *(97.726)*
50% of Pull at Reduced Engine Speed—Two Hours 6th Gear											
52.50 *(39.15)*	3982 *(17.71)*	4.94 *(7.96)*	1374	2.98	3.795 *(14.367)*	0.505 *(0.307)*	13.83 *(2.725)*	187 *(86.1)*	75 *(23.6)*	82 *(27.5)*	28.915 *(97.642)*
MAXIMUM POWER IN SELECTED GEARS											
70.93 *(52.89)*	12450 *(55.38)*	2.14 *(3.44)*	2298	14.77		2nd.Gear		185 *(84.7)*	64 *(17.8)*	70 *(21.1)*	28.890 *(97.557)*
93.57 *(69.78)*	10365 *(46.11)*	3.39 *(5.45)*	2200	9.29		3rd Gear		193 *(89.2)*	68 *(20.0)*	72 *(22.2)*	28.980 *(97.861)*
95.65 *(71.33)*	7947 *(35.35)*	4.51 *(7.26)*	2197	6.48		4th Gear		193 *(89.4)*	67 *(17.4)*	70 *(21.1)*	28.980 *(97.861)*
93.89 *(70.01)*	5854 *(26.04)*	6.01 *(9.68)*	2200	4.58		5th Gear		193 *(89.4)*	69 *(20.6)*	73 *(22.8)*	28.980 *(97.861)*
93.79 *(69.94)*	4464 *(19.86)*	7.88 *(12.68)*	2200	3.35		6th Gear		194 *(90.0)*	71 *(21.7)*	75 *(23.9)*	28.980 *(97.861)*

LUGGING ABILITY IN 4th GEAR

Crankshaft Speed rpm	2197	1981	1757	1541	1317	1095
Pull—lbs *(kN)*	7947 *(35.35)*	8694 *(38.67)*	9252 *(41.16)*	9304 *(41.39)*	9331 *(41.51)*	9258 *(41.18)*
Increase in Pull %	0	9	16	17	17	16
Power—Hp *(kW)*	95.65 *(71.33)*	93.57 *(69.77)*	87.72 *(65.41)*	77.28 *(57.62)*	66.17 *(49.34)*	54.61 *(40.72)*
Speed— Mph *(km/h)*	4.51 *(7.26)*	4.04 *(6.50)*	3.56 *(5.72)*	3.11 *(5.01)*	2.66 *(4.28)*	2.21 *(3.56)*
Slip %	6.48	7.23	7.77	8.04	8.17	8.04

Department of Agricultural Engineering

Dates of Test: August 20 to September 3, 1980, Cab sound test No. 80-5, November 20, 1980

Manufacturer: JOHN DEERE WATERLOO TRACTOR WORKS, P.O. Box 270, Waterloo, Iowa 50704

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8386 **Fuel weight** 6.982 lbs/gal *(0.837 kg/l)* **Oil SAE 30 API service classification** CD, CC and SD **To motor** 4.372 gal *(16.548 l)* **Drained from motor** 3.743 gal *(14.167 l)* **Transmission and final drive lubricant** John Deere Hy-Gard **Total time engine was operated** 32.5 hours

ENGINE: Make John Deere Diesel **Type** six cylinder vertical **Serial No.** 6466DR-02 144778RG **Crankshaft** lengthwise **Rated rpm** 2200 **Bore and stroke** 4.56" × 4.75" *(115.8 mm × 120.6 mm)* **Compression ratio** 17.0 to 1 **Displacement** 466 cu in *(7636 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with dust evacuator **Oil filter** one full flow cartridge **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for transmission and hydraulic oil **Fuel filter** one paper element **Muffler** vertical **Cooling medium temperature control** two thermostats.

CHASSIS: Type standard with duals **Serial No.** 4240P 019519R **Tread width** rear 60" *(1524 mm)* to 118.4" *(3004 mm)* front 56" *(1422 mm)* to 82" *(2083 mm)* **Wheel base** 106.7" *(2709 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 30.1" *(765 mm)* Vertical distance above roadway 40.1" *(1019 mm)* Horizontal distance from center of rear wheel tread 0.1" *(2 mm)* to the left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with full range power shift **Advertised speeds mph *(km/h)*** first 1.7 *(2.7)* second 2.4 *(3.9)* third 3.8 *(6.0)* fourth 4.8 *(7.8)* fifth 6.3 *(10.2)* sixth 8.2 *(13.2)* seventh 10.7 *(17.2)* eighth 18.1 *(29.1)* reverse 2.1 *(3.3)*, 2.9 *(4.7)*, 4.6 *(7.4)*, 5.9 *(9.5)* **Clutch** wet multiple disc hydraulically power actuated and operated by foot pedal **Brakes** wet disc hydraulically power actuated and operated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 143.9" *(3.66 m)* left 143.9" *(3.66 m)* (on concrete surface without brake) right 161.8" *(4.11 m)* left 161.8" *(4.11 m)* **Turning space diameter** (on concrete surface with brake applied) right 293.3" *(7.45 m)* left 293.3" *(7.45 m)* (on concrete surface without brake) right 334.6" *(8.50 m)* left 334.6" *(8.50 m)* **Power take-off** 1000 rpm at 2176 engine rpm and 540 rpm at 2182 engine rpm.

REPAIRS and ADJUSTMENTS: During preliminary PTO test, the hydraulic pump seal drain

TRACTOR SOUND LEVEL	With Cab dB(A)	W/O Cab dB(A)
Maximum Available Power—Two Hours	79.0	96.5
75% of Pull at Maximum Power—Ten Hours	79.0	96.5
50% of Pull at Maximum Power—Two Hours	78.0	96.5
50% of Pull at Reduced Engine Speed—Two Hours	74.5	92.0
Bystander in 8th gear	91.0	89.5

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Four 18.4-34; 6; 12 *(85)*	Four 18.4-34; 6; 12 *(85)*
Ballast	—Liquid (each inner)	1000 lb *(454 kg)*	None
	—Cast Iron (each)	110 lb *(50 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 10.00-16; 6; 32 *(220)*	Two 10.00-16; 6; 32 *(220)*
Ballast	—Liquid (each)	None	None
	Cast Iron (each)	None	None
Height of Drawbar		21 in *(535 mm)*	21 in *(535 mm)*
Static Weight with Operator	—Rear	10880 lb *(4935 kg)*	8440 lb *(3828 kg)*
	—Front	3380 lb *(1533 kg)*	3380 lb *(1533 kg)*
	—Total	14260 lb *(6468 kg)*	11820 lb *(5361 kg)*

tube failed. This tube was replaced following the PTO tests.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump return was 144°F *(62.2°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1362.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers

John Deere 4240 Power Shift Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1363 — MASSEY-FERGUSON MF205 DIESEL 6 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—548 rpm)								
16.56 *(12.35)*	2400	1.288 *(4.876)*	0.543 *(0.330)*	12.86 *(2.533)*	176 *(80.2)*	58 *(14.3)*	75 *(24.0)*	28.917 *(97.647)*
Standard Power Take-off Speed (540 rpm)—One Hour								
16.34 *(12.18)*	2367	1.260 *(4.770)*	0.538 *(0.327)*	12.97 *(2.553)*	176 *(79.8)*	58 *(14.2)*	75 *(23.9)*	28.905 *(97.608)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
14.55 *(10.85)*	2482	1.213 *(4.592)*	0.581 *(0.354)*	12.00 *(2.363)*	171 *(76.9)*	58 *(14.4)*	75 *(23.9)*	....
0.00 *(0.00)*	2578	0.507 *(1.919)*	....	....	138 *(58.6)*	58 *(14.4)*	75 *(23.6)*	....
7.39 *(5.51)*	2518	0.839 *(3.176)*	0.792 *(0.482)*	8.81 *(1.735)*	150 *(65.6)*	58 *(14.4)*	74 *(23.3)*	....
16.43 *(12.25)*	2400	1.307 *(4.948)*	0.555 *(0.338)*	12.56 *(2.476)*	175 *(79.4)*	58 *(14.4)*	74 *(23.3)*	....
3.74 *(2.79)*	2548	0.679 *(2.570)*	1.269 *(0.772)*	5.50 *(1.086)*	145 *(62.5)*	59 *(15.0)*	75 *(23.9)*	....
10.97 *(8.18)*	2496	0.972 *(3.679)*	0.618 *(0.376)*	11.29 *(2.223)*	159 *(70.6)*	59 *(15.0)*	75 *(23.9)*	....
Av 8.85 ***Av (6.60)***	**2504**	**0.920** ***(3.483)***	**0.725** ***(0.441)***	**9.62** ***(1.895)***	**156** ***(68.9)***	**58** ***(14.6)***	**75** ***(23.7)***	**28.920** ***(97.659)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 5th (H2) Gear											
12.87 *(9.60)*	1101 *(4.90)*	4.38 *(7.06)*	2398	7.55	1.290 *(4.884)*	0.699 *(0.425)*	9.98 *(1.965)*	167 *(75.0)*	60 *(15.3)*	70 *(20.8)*	29.085 *(98.216)*
75% of Pull at Maximum Power—Ten Hours 5th (H2) Gear											
10.69 *(7.97)*	866 *(3.85)*	4.63 *(7.45)*	2479	5.51	1.107 *(4.192)*	0.723 *(0.440)*	9.65 *(1.902)*	155 *(68.5)*	60 *(15.4)*	64 *(17.7)*	28.857 *(97.446)*
50% of Pull at Maximum Power—Two Hours 5th (H2) Gear											
7.34 *(5.48)*	579 *(2.58)*	4.75 *(7.65)*	2508	4.15	0.914 *(3.459)*	0.868 *(0.528)*	8.03 *(1.583)*	145 *(62.5)*	55 *(12.5)*	63 *(16.9)*	28.930 *(97.692)*
50% of Pull at Reduced Engine Speed—Two Hours 6th (H3) Gear											
7.36 *(5.49)*	581 *(2.59)*	4.75 *(7.64)*	1597	3.80	0.645 *(2.442)*	0.611 *(0.372)*	11.41 *(2.248)*	159 *(70.6)*	62 *(16.4)*	78 *(25.3)*	28.910 *(97.625)*
MAXIMUM POWER IN SELECTED GEARS											
7.78 *(5.80)*	1995 *(8.87)*	1.46 *(2.35)*	2502	14.81		3rd (L3) Gear		138 *(58.6)*	48 *(8.9)*	50 *(10.0)*	28.930 *(97.692)*
12.92 *(9.63)*	1915 *(8.52)*	2.53 *(4.07)*	2400	13.97		4th (H1) Gear		154 *(67.8)*	51 *(10.6)*	55 *(12.8)*	28.930 *(97.692)*
13.45 *(10.03)*	1150 *(5.11)*	4.39 *(7.06)*	2399	7.51		5th (H2) Gear		161 *(71.4)*	53 *(11.7)*	61 *(16.1)*	29.090 *(98.233)*
12.93 *(9.64)*	684 *(3.04)*	7.09 *(11.40)*	2399	4.41		6th (H3) Gear		164 *(73.1)*	56 *(13.3)*	65 *(18.3)*	29.090 *(98.233)*

LUGGING ABILITY IN 5th (H2) GEAR

Crankshaft Speed rpm	2399	2165	1919	1688	1440	1196
Pull—lbs *(kN)*	1150 *(5.11)*	1177 *(5.23)*	1352 *(6.01)*	1353 *(6.02)*	1337 *(5.95)*	1325 *(5.89)*
Increase in Pull %	0	2	18	18	16	15
Power—Hp *(kW)*	13.45 *(10.03)*	12.40 *(9.24)*	12.42 *(9.26)*	10.91 *(8.13)*	9.22 *(6.87)*	7.59 *(5.66)*
Speed—Mph *(km/h)*	4.39 *(7.06)*	3.95 *(6.36)*	3.45 *(5.55)*	3.02 *(4.87)*	2.59 *(4.16)*	2.15 *(3.46)*
Slip %	7.51	7.63	9.16	9.48	9.16	9.09

Department of Agricultural Engineering

Dates of Test: September 18 to October 3, 1980

Manufacturer: TOYOSHA COMPANY LTD, 55 Joshoji-16, Kadoma City, Osaka, Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8378 **Fuel weight** 6.976 lbs/gal *(0.836 kg/l)* **Oil SAE** 20-20W **API service classification** SB/SE-CA/CC **To motor** 0.845 gal *(3.199 l)* **Drained from motor** 0.746 gal *(2.825 l)* **Transmission and final drive lubricant** Massey Ferguson Permatran fluid **Total time engine was operated** 35.0 hours

ENGINE: Make Toyosha Diesel **Type** two cylinder vertical **Serial No.** S107-01859 **Crankshaft** lengthwise **Rated rpm** 2400 **Bore and stroke** 3.46" × 3.46" *(88 mm × 88 mm)* **Compression ratio** 23 to 1 **Displacement** 65.2 cu in *(1069 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** one paper element **Oil filter** one paper cartridge **Fuel filter** one paper cartridge **Muffler** vertical **Cooling medium temperature control** none

CHASSIS: Type standard **Serial No.** 01267 **Tread width** rear 35.4" *(900 mm)* or 40.2" *(1020 mm)* front 35.8" *(910 mm)* **Wheel base** 55.3" *(1405 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 21.4" *(544 mm)* Vertical distance above roadway 24.5" *(622 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph (km/h)** first 0.7 *(1.1)* second 1.1 *(1.8)* third 1.7 *(2.7)* fourth 3.0 *(4.8)* fifth 4.9 *(7.9)* sixth 7.7 *(12.4)* reverse 1.6 *(2.6)*, 7.0 *(11.3)* **Clutch** dry disc operated by foot pedal **Brakes** drum and shoe operated by two foot pedals which can be locked together **Steering** mechanical **Turning radius** (on concrete surface with brake applied) right 74.4" *(1.89 m)* left 75.6" *(1.92 m)* (on concrete surface without brake) right 84.9" *(2.16 m)* left 86.3" *(2.19 m)* **Turning space diameter** (on concrete surface with brake applied) right 159.5" *(4.05 m)* left 162.0" *(4.11 m)* (on concrete surface without brake) right 179.5" *(4.56 m)* left 182.2" *(4.63 m)* **Power take-off** 540 rpm at 2367 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 131°F *(55.2°C)*. Four gears were chosen between 15% slip and 10 mph *(16.1 km/h)*. During final

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	93.5
75% of Pull at Maximum Power—Ten Hours	95.0
50% of Pull at Maximum Power—Two Hours	94.0
50% of Pull at Reduced Engine Speed—Two Hours	89.5
Bystander in 6th (H3) gear	77.5

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 8.3/8-24; 4; 14 *(95)*	Two 8.3/8-24; 4; 14 *(95)*
Ballast	—Liquid (each)	145 lb *(66 kg)*	None
	—Cast Iron (each)	270 lb *(122 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 4.00-12; 4; 44 *(305)*	Two 4.00-12; 4; 44 *(305)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	52 lb *(24 kg)*	None
Height of Drawbar		11.5 in *(290 mm)*	11.5 in *(290 mm)*
Static Weight with Operator	—Rear	2035 lb *(923 kg)*	1205 lb *(547 kg)*
	—Front	805 lb *(365 kg)*	700 lb *(317 kg)*
	—Total	2840 lb *(1288 kg)*	1905 lb *(864 kg)*

inspection both cylinder walls were found to be slightly scratched.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1363.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers

Massey-Ferguson MF205 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1364 —
MASSEY-FERGUSON MF205-4 DIESEL
6 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	Fuel Consumption lb/hp.hr *(kg/kW.h)*	Fuel Consumption Hp.hr/gal *(kW.h/l)*	Temperature °F (°C) Cooling medium	Temperature °F (°C) Air wet bulb	Temperature °F (°C) Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—548 rpm)									
	16.40 *(12.23)*	2400	1.289 *(4.879)*	0.548 *(0.333)*	12.73 *(2.507)*	189 *(87.0)*	65 *(18.2)*	75 *(23.8)*	28.870 *(97.490)*
Standard Power Take-off Speed (540 rpm)—One Hour									
	16.18 *(12.07)*	2366	1.261 *(4.773)*	0.544 *(0.331)*	12.83 *(2.529)*	189 *(87.2)*	65 *(18.3)*	75 *(24.1)*	28.880 *(97.523)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	14.38 *(10.72)*	2478	1.165 *(4.410)*	0.565 *(0.344)*	12.34 *(2.431)*	183 *(83.6)*	65 *(18.3)*	75 *(23.9)*	....
	0.00 *(0.00)*	2568	0.507 *(1.919)*	....	....	146 *(63.3)*	65 *(18.3)*	75 *(23.9)*	....
	7.30 *(5.44)*	2516	0.821 *(3.108)*	0.785 *(0.478)*	8.89 *(1.750)*	161 *(71.7)*	65 *(18.3)*	75 *(23.9)*	....
	16.44 *(12.26)*	2401	1.294 *(4.898)*	0.549 *(0.334)*	12.70 *(2.503)*	188 *(86.7)*	65 *(18.3)*	75 *(23.9)*	....
	3.70 *(2.76)*	2546	0.667 *(2.525)*	1.257 *(0.765)*	5.55 *(1.093)*	155 *(68.1)*	66 *(18.6)*	76 *(24.2)*	....
	10.86 *(8.10)*	2493	0.981 *(3.713)*	0.630 *(0.383)*	11.08 *(2.182)*	170 *(76.7)*	65 *(18.3)*	75 *(23.9)*	....
Av *Av*	**8.78** ***(6.55)***	**2500**	**0.906** ***(3.430)***	**0.720** ***(0.438)***	**9.69** ***(1.910)***	**167** ***(75.0)***	**65** ***(18.4)***	**75** ***(23.9)***	**28.860** ***(97.456)***

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	Fuel Consumption lb/hp.hr *(kg/kW.h)*	Fuel Consumption Hp.hr/gal *(kW.h/l)*	Temp. °F (°C) Cooling med	Temp. °F (°C) Air wet bulb	Temp. °F (°C) Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 5th (H2) Gear											
12.78 *(9.53)*	983 *(4.37)*	4.87 *(7.84)*	2400	5.55	1.272 *(4.816)*	0.695 *(0.423)*	10.04 *(1.978)*	184 *(84.2)*	60 *(15.6)*	78 *(25.3)*	29.070 *(98.165)*
75% of Pull at Maximum Power--Ten Hours 5th (H2) Gear											
10.73 *(8.00)*	785 *(3.49)*	5.13 *(8.25)*	2484	4.04	1.122 *(4.246)*	0.729 *(0.444)*	9.57 *(1.885)*	174 *(78.9)*	58 *(14.3)*	75 *(23.8)*	28.937 *(97.716)*
50% of Pull at Maximum Power—Two Hours 5th (H2) Gear											
7.33 *(5.47)*	525 *(2.33)*	5.24 *(8.44)*	2515	3.08	0.914 *(3.459)*	0.869 *(0.529)*	8.02 *(1.581)*	148 *(64.4)*	49 *(9.4)*	58 *(14.4)*	28.835 *(97.371)*
50% of Pull at Reduced Engine Speed—Two Hours 6th (H3) Gear											
7.40 *(5.52)*	528 *(2.35)*	5.26 *(8.46)*	1466	2.72	0.717 *(2.713)*	0.676 *(0.411)*	10.32 *(2.033)*	166 *(74.2)*	57 *(13.9)*	74 *(23.3)*	28.850 *(97.422)*
MAXIMUM POWER IN SELECTED GEARS											
9.91 *(7.39)*	2131 *(9.48)*	1.74 *(2.81)*	2494	14.84	3rd (L3) Gear			149 *(64.7)*	46 *(7.8)*	50 *(10.0)*	29.030 *(98.030)*
13.23 *(9.87)*	1735 *(7.72)*	2.86 *(4.60)*	2401	10.51	4th (H1) Gear			178 *(81.1)*	57 *(13.9)*	70 *(21.1)*	29.080 *(98.199)*
13.57 *(10.12)*	1047 *(4.66)*	4.86 *(7.82)*	2402	5.80	5th (H2) Gear			173 *(78.1)*	53 *(11.7)*	63 *(17.2)*	29.070 *(98.165)*
12.45 *(9.28)*	545 *(2.42)*	8.57 *(13.79)*	2401	3.15	6th (H3) Gear			181 *(82.5)*	58 *(14.4)*	73 *(22.8)*	29.080 *(98.199)*

LUGGING ABILITY IN 5th (H2) GEAR

Crankshaft Speed rpm	2402	2162	1919	1681	1440	1189
Pull—lbs *(kN)*	1047 *(4.66)*	1097 *(4.88)*	1215 *(5.40)*	1240 *(5.51)*	1199 *(5.33)*	1165 *(5.18)*
Increase in Pull %	0	5	16	18	14	11
Power—Hp *(kW)*	13.57 *(10.12)*	12.77 *(9.52)*	12.43 *(9.27)*	11.09 *(8.27)*	9.21 *(6.87)*	7.41 *(5.52)*
Speed—Mph *(km/h)*	4.86 *(7.82)*	4.36 *(7.02)*	3.84 *(6.18)*	3.35 *(5.40)*	2.88 *(4.64)*	2.39 *(3.84)*
Slip %	5.80	6.23	7.06	7.22	6.89	6.73

Department of Agricultural Engineering

Dates of Test: September 24 to October 9, 1980

Manufacturer: TOYOSHA COMPANY LTD, 55 Joshoji-16, Kadoma City, Osaka Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** ***(15°/15°)*** 0.8379 **Fuel weight** 6.976 lbs/gal *(0.836 kg/l)* **Oil SAE** 20-20W **API service classification** SB/SE-CA/CC **To motor** 0.824 gal *(3.120 l)* **Drained from motor** 0.772 gal *(2.922 l)* **Transmission and final drive lubricant** Massey Ferguson Permatran fluid **Total time engine was operated** 36.5 hours

ENGINE: Make Toyosha Diesel **Type** two cylinder vertical **Serial No.** S 107 MO 1709 **Crankshaft** lengthwise **Rated rpm** 2400 **Bore and stroke** 3.46" × 3.46" *(88 mm × 88 mm)* **Compression ratio** 23 to 1 **Displacement** 65.2 cu in *(1069 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** one paper element **Oil filter** one full flow paper cartridge **Fuel filter** one paper cartridge **Muffler** vertical **Cooling medium temperature control** none

CHASSIS: Type front wheel assist **Serial No.** 00680 **Tread width** rear 35.4" *(900 mm)* or 40.2" *(1020 mm)* front 38" *(965 mm)* **Wheel base** 54.9" *(1395 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 23.9" *(607 mm)* Vertical distance above roadway 24.9" *(632 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph** ***(km/h)*** first 0.7 *(1.1)* second 1.2 *(1.9)* third 2.0 *(3.2)* fourth 3.3 *(5.3)* fifth 5.4 *(8.7)* sixth 9.2 *(14.8)* reverse 1.7 *(2.7)*, 7.7 *(12.4)* **Clutch** dry disc operated by foot pedal **Brakes** drum and shoe operated by two foot pedals which can be locked together **Steering** mechanical **Turning radius** (on concrete surface with brake applied) right 86.5" *(2.20 m)* left 86.3" *(2.19 m)* (on concrete surface without brake) right 96.5" *(2.45 m)* left 100.5" *(2.55 m)* **Turning space diameter** (on concrete surface with brake applied) right 186.5" *(4.74 m)* left 185" *(4.70 m)* (on concrete surface without brake) right 206.5" *(5.25 m)* left 214.5" *(5.45 m)* **Power take-off** 540 rpm at 2366 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 131°F *(54.7°C)*. Four gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	95.0	95.5
75% of Pull at Maximum Power—Ten Hours		94.0
50% of Pull at Maximum Power—Two Hours		94.5
50% of Pull at Reduced Engine Speed—Two Hours		92.0
Bystander in 6th (H3) gear		77.0

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

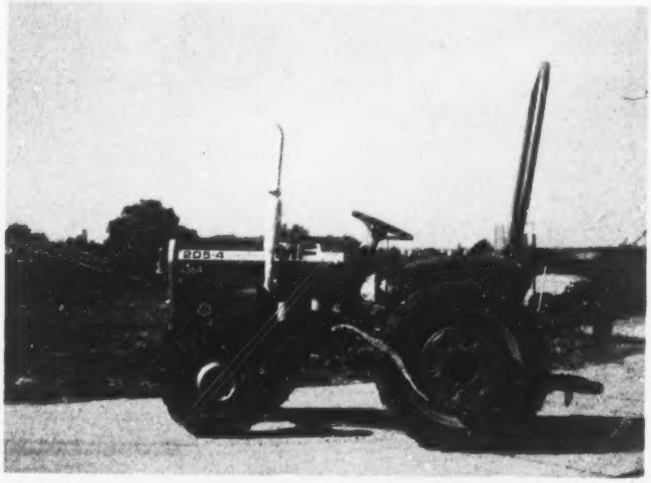
Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F (°C)			
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 5th (H2) Gear											
12.75 *(9.50)*	958 *(4.26)*	4.99 *(8.03)*	2399	4.13	1.218 *(4.612)*	0.667 *(0.406)*	10.46 *(2.061)*	187 *(85.8)*	61 *(16.1)*	80 *(26.7)*	29.060 *(98.131)*
MAXIMUM POWER IN SELECTED GEARS											
11.86 *(8.84)*	2557 *(11.38)*	1.74 *(2.80)*	2461	14.73	3rd (L3) Gear			156 *(68.9)*	50 *(10.0)*	56 *(13.3)*	29.060 *(98.131)*
13.49 *(10.06)*	1016 *(4.52)*	4.98 *(8.01)*	2402	4.50	5th (H2) Gear			176 *(80.0)*	55 *(12.8)*	67 *(19.4)*	29.070 *(98.165)*

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 8.3/8-24; 4; 16 *(110)*	Two 8.3/8-24; 4; 16 *(110)*
Ballast	—Liquid (each)	140 lb *(64 kg)*	None
	—Cast Iron (each)	260 lb *(118 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 6-14; 4; 20 *(140)*	Two 6-14; 4; 20 *(140)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	53 lb *(24 kg)*	None
Height of Drawbar		11.5 in *(290 mm)*	11.5 in *(290 mm)*
Static Weight with Operator	—Rear	2094 lb *(950 kg)*	1295 lb *(587 kg)*
	—Front	1026 lb *(465 kg)*	920 lb *(417 kg)*
	—Total	3120 lb *(1415 kg)*	2215 lb *(1004 kg)*

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1364**.

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers



Massey-Ferguson MF205-4 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1365 — MASSEY-FERGUSON MF210 DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/h)	 lb/hp.hr (kg/kW.h)	 Hp.hr/gal (kW.h/l)	Temperature °F (°C) Cooling medium	 Air wet bulb	 Air dry bulb	Barometer inch Hg (kPa)
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—580 rpm)								
21.96 *(16.38)*	2500	1.650 *(6.246)*	0.524 *(0.319)*	13.31 *(2.622)*	171 *(77.1)*	59 *(15.1)*	75 *(24.0)*	28.750 *(97.084)*
Standard Power Take-off Speed (540 rpm)—One Hour								
21.23 *(15.83)*	2326	1.560 *(5.905)*	0.513 *(0.312)*	13.61 *(2.681)*	171 *(77.2)*	60 *(15.3)*	75 *(23.9)*	28.755 *(97.101)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
19.42 *(14.48)*	2598	1.466 *(5.549)*	0.527 *(0.320)*	13.24 *(2.609)*	168 *(75.3)*	60 *(15.6)*	75 *(23.9)*	....
0.00 *(0.00)*	2730	0.499 *(1.889)*	....	....	159 *(70.6)*	60 *(15.6)*	75 *(23.9)*	....
9.90 *(7.38)*	2648	0.925 *(3.502)*	0.652 *(0.397)*	10.70 *(2.107)*	163 *(72.8)*	60 *(15.6)*	75 *(23.9)*	....
22.01 *(16.41)*	2500	1.669 *(6.318)*	0.529 *(0.322)*	13.19 *(2.597)*	170 *(76.7)*	60 *(15.6)*	75 *(23.9)*	....
5.03 *(3.75)*	2685	0.710 *(2.688)*	0.985 *(0.599)*	7.08 *(1.395)*	160 *(70.8)*	60 *(15.3)*	75 *(23.6)*	....
14.70 *(10.96)*	2622	1.165 *(4.410)*	0.553 *(0.336)*	12.61 *(2.485)*	165 *(73.9)*	60 *(15.6)*	75 *(23.9)*	....
Av 11.84 ***Av (8.83)***	**2631**	**1.072** ***(4.058)***	**0.632** ***(0.384)***	**11.04** ***(2.176)***	**164** ***(73.3)***	**60** ***(15.5)***	**75** ***(23.8)***	**28.780** ***(97.186)***

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	 lb/hp.hr (kg/kW.h)	 Hp.hr/gal (kW.h/l)	Temp. °F (°C) Cool-ing med	 Air wet bulb	 Air dry bulb	Barom. inch Hg (kPa)
Maximum Available Power—Two Hours 10th (H2) Gear											
17.28 *(12.89)*	1113 *(4.95)*	5.82 *(9.37)*	2498	7.14	1.595 *(6.037)*	0.644 *(0.392)*	10.84 *(2.135)*	170 *(76.7)*	66 *(18.6)*	82 *(27.5)*	28.910 *(97.625)*
75% of Pull at Maximum Power—Ten Hours 10th (H2) Gear											
14.30 *(10.66)*	877 *(3.90)*	6.12 *(9.84)*	2578	5.43	1.358 *(5.141)*	0.663 *(0.403)*	10.53 *(2.074)*	170 *(76.4)*	71 *(21.7)*	83 *(28.4)*	28.734 *(97.030)*
50% of Pull at Maximum Power—Two Hours 10th (H2) Gear											
9.90 *(7.38)*	581 *(2.59)*	6.38 *(10.27)*	2637	3.55	1.057 *(4.002)*	0.745 *(0.453)*	9.36 *(1.844)*	165 *(73.9)*	68 *(19.7)*	76 *(24.2)*	28.615 *(96.629)*
50% of Pull at Reduced Engine Speed—Two Hours 11th (H3) Gear											
9.76 *(7.28)*	574 *(2.55)*	6.37 *(10.26)*	2009	3.40	0.860 *(3.256)*	0.615 *(0.374)*	11.35 *(2.235)*	167 *(74.7)*	70 *(21.1)*	85 *(29.4)*	28.575 *(96.493)*

MAXIMUM POWER IN SELECTED GEARS

13.53 *(10.09)*	2159 *(9.60)*	2.35 *(3.78)*	2608	14.97		8th (M4) Gear		164 *(73.3)*	66 *(18.9)*	68 *(20.0)*	28.620 *(96.645)*
17.49 *(13.04)*	1663 *(7.40)*	3.94 *(6.35)*	2502	11.47		9th (H1) Gear		170 *(76.4)*	64 *(17.8)*	80 *(26.7)*	28.930 *(97.692)*
18.08 *(13.48)*	1167 *(5.19)*	5.81 *(9.35)*	2498	7.39		10th (H2) Gear		169 *(76.1)*	62 *(16.7)*	77 *(25.0)*	28.920 *(97.659)*
17.92 *(13.36)*	866 *(3.85)*	7.76 *(12.49)*	2499	5.47		11th (H3) Gear		169 *(76.1)*	64 *(17.8)*	79 *(26.1)*	28.920 *(97.659)*

LUGGING ABILITY IN 10th (H2) GEAR

Crankshaft Speed rpm	2498	2248	1998	1751	1495	1233
Pull—lbs *(kN)*	1167 *(5.19)*	1263 *(5.62)*	1317 *(5.86)*	1337 *(5.95)*	1364 *(6.07)*	1334 *(5.93)*
Increase in Pull %	0	8	13	15	17	14
Power—Hp *(kW)*	18.08 *(13.48)*	17.48 *(13.04)*	16.14 *(12.04)*	14.34 *(10.70)*	12.45 *(9.28)*	10.06 *(7.50)*
Speed—Mph *(km/h)*	5.81 *(9.35)*	5.19 *(8.35)*	4.60 *(7.40)*	4.02 *(6.47)*	3.42 *(5.51)*	2.83 *(4.55)*
Slip %	7.39	8.07	8.25	8.43	8.70	8.52

Department of Agricultural Engineering

Dates of Test: September 15 to 24, 1980

Manufacturer: TOYOSHA COMPANY LTD, 55 Joshoji-16, Kadoma City, Osaka Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60° *(15°/15°)*** 0.8378 **Fuel weight** 6.976 lbs/gal *(0.836 kg/l)* **Oil SAE** 20-20W **API service classification** SB/SE-CA/CC **To motor** 1.003 gal *(3.796 l)* **Drained from motor** 0.899 gal *(3.404 l)* **Transmission and final drive lubricant** Massey Ferguson Permatran fluid **Total time engine was operated** 40.0 hours

ENGINE: Make Toyosha Diesel **Type** two cylinder vertical **Serial No.** S 126 MO 2122 **Crankshaft** lengthwise **Rated rpm** 2500 **Bore and stroke** 3.62″ × 3.74″ *(92 mm × 95 mm)* **Compression ratio** 23 to 1 **Displacement** 77.1 cu in *(1263 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** one paper element **Oil filter** one full flow paper cartridge **Fuel filter** one paper cartridge **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type standard **Serial No.** 01532 **Tread width** rear 39.2″ *(995 mm)* to 51″ *(1295 mm)* front 39.8″ *(1010 mm)* to 52.2″ *(1325 mm)* **Wheel base** 60.2″ *(1530 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 23.0″ *(584 mm)* Vertical distance above roadway 27.2″ *(691 mm)* Horizontal distance from center of rear wheel tread 0″ *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 0.3 *(0.5)* second 0.4 *(0.6)* third 0.6 *(1.0)* fourth 0.8 *(1.3)* fifth 1.0 *(1.6)* sixth 1.4 *(2.3)* seventh 1.8 *(2.9)* eighth 2.7 *(4.3)* ninth 4.5 *(7.2)* tenth 6.4 *(10.3)* eleventh 8.4 *(13.5)* twelfth 12.4 *(20.0)* reverse 0.6 *(1.0)*, 1.9 *(3.1)*, 8.8 *(14.2)* **Clutch** dry single disc operated by foot pedal **Brakes** drum and shoe operated by two foot pedals which can be locked together **Steering** mechanical **Turning radius** (on concrete surface with brake applied) right 98.8″ *(2.51 m)* left 99.1″ *(2.52 m)* (on concrete surface without brake) right 111.4″ *(2.83 m)* left 112.3″ *(2.85 m)* **Turning space diameter** (on concrete surface with brake applied) right 202.5″ *(5.14 m)* left 203.5″ *(5.17 m)* (on concrete surface without brake) right 228″ *(5.79 m)* left 229.8″ *(5.84 m)* **Power take-off** 540 rpm at 2326 engine rpm.

REPAIRS and ADJUSTMENTS: The battery failed following the limber up period and was replaced.

REMARKS: All test results were determined from observed data obtained in accordance with

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	95.0
75% of Pull at Maximum Power—Ten Hours	93.0
50% of Pull at Maximum Power—Two Hours	91.5
50% of Pull at Reduced Engine Speed—Two Hours	91.5
Bystander in 12th (H4) gear	79.0

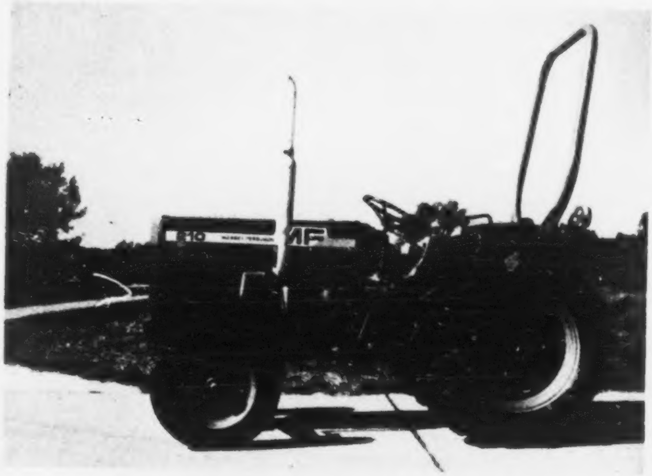
TIRES, BALLAST AND WEIGHT		**With Ballast**	**Without Ballast**
Rear Tires	—No., size, ply & psi *(kPa)*	Two 11.2/10-24; 4; 14 *(95)*	Two 11.2/10-24; 4; 14 *(95)*
Ballast	—Liquid (each)	295 lb *(133 kg)*	None
	—Cast Iron (each)	198 lb *(90 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 5.00-15; 4; 36 *(250)*	Two 5.00-15; 4; 36 *(250)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	52 lb *(24 kg)*	None
Height of Drawbar		12.5 in *(320 mm)*	12.5 in *(320 mm)*
Static Weight with Operator	—Rear	2545 lb *(1154 kg)*	1560 lb *(708 kg)*
	—Front	1005 lb *(456 kg)*	900 lb *(408 kg)*
	—Total	3550 lb *(1610 kg)*	2460 lb *(1116 kg)*

SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 142°F *(61.2°C)*. Four gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1365.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers



Massey-Ferguson MF210 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1366 — MASSEY-FERGUSON MF210-4 DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—580 rpm)									
	21.77 *(16.23)*	2500	1.696 *(6.420)*	0.543 *(0.331)*	12.84 *(2.528)*	179 *(81.4)*	60 *(15.4)*	75 *(23.9)*	29.017 *(97.985)*
Standard Power Take-off Speed (540 rpm)—One Hour									
	21.02 *(15.67)*	2326	1.594 *(6.034)*	0.529 *(0.322)*	13.18 *(2.597)*	178 *(80.9)*	59 *(15.0)*	75 *(24.1)*	29.005 *(97.946)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	19.31 *(14.40)*	2608	1.479 *(5.599)*	0.535 *(0.325)*	13.05 *(2.572)*	176 *(79.7)*	59 *(15.0)*	76 *(24.2)*	....
	0.00 *(0.00)*	2735	0.525 *(1.987)*	....	....	169 *(76.1)*	59 *(15.0)*	75 *(23.9)*	....
	9.86 *(7.35)*	2664	0.946 *(3.581)*	0.669 *(0.407)*	10.42 *(2.052)*	173 *(78.3)*	59 *(15.0)*	75 *(23.9)*	....
	21.96 *(16.38)*	2500	1.712 *(6.481)*	0.544 *(0.331)*	12.83 *(2.527)*	178 *(80.8)*	59 *(15.0)*	76 *(24.2)*	....
	5.01 *(3.74)*	2704	0.740 *(2.801)*	1.031 *(0.627)*	6.77 *(1.335)*	171 *(76.9)*	59 *(15.0)*	75 *(23.9)*	....
	14.64 *(10.92)*	2636	1.183 *(4.478)*	0.564 *(0.343)*	12.38 *(2.439)*	174 *(78.9)*	59 *(15.0)*	75 *(23.9)*	....
Av ***Av***	**11.80** ***(8.80)***	**2641**	**1.097** ***(4.153)***	**0.649** ***(0.395)***	**10.75** ***(2.119)***	**173** ***(78.5)***	**59** ***(15.0)***	**75** ***(24.0)***	**29.007** ***(97.951)***

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 10th (H2) Gear											
16.97 *(12.65)*	1233 *(5.48)*	5.16 *(8.31)*	2500	9.12	1.702 *(6.444)*	0.700 *(0.426)*	9.97 *(1.963)*	177 *(80.3)*	60 *(15.3)*	74 *(23.3)*	28.850 *(97.422)*
75% of Pull at Maximum Power—Ten Hours 10th (H2) Gear											
14.25 *(10.63)*	963 *(4.28)*	5.55 *(8.94)*	2623	6.74	1.365 *(5.169)*	0.668 *(0.406)*	10.44 *(2.057)*	173 *(78.4)*	50 *(9.8)*	60 *(15.8)*	29.165 *(98.486)*
50% of Pull at Maximum Power—Two Hours 10th (H2) Gear											
9.87 *(7.36)*	641 *(2.85)*	5.77 *(9.29)*	2668	4.68	1.147 *(4.341)*	0.811 *(0.493)*	8.61 *(1.695)*	173 *(78.1)*	48 *(8.6)*	57 *(13.6)*	29.270 *(98.840)*
50% of Pull at Reduced Engine Speed—Two Hours 11th (H3) Gear											
9.93 *(7.41)*	645 *(2.87)*	5.78 *(9.30)*	2041	4.58	0.950 *(3.595)*	0.667 *(0.406)*	10.46 *(2.061)*	170 *(76.7)*	52 *(10.8)*	66 *(18.9)*	29.235 *(98.722)*
MAXIMUM POWER IN SELECTED GEARS											
13.64 *(10.17)*	2158 *(9.60)*	2.37 *(3.81)*	2643	14.72		8th (M4) Gear		168 *(75.6)*	36 *(2.2)*	39 *(3.9)*	29.260 *(98.807)*
17.00 *(12.68)*	1857 *(8.26)*	3.43 *(5.53)*	2500	14.69		9th (H1) Gear		176 *(80.0)*	56 *(13.3)*	67 *(19.4)*	28.900 *(97.591)*
17.60 *(13.13)*	1278 *(5.68)*	5.17 *(8.32)*	2498	8.91		10th (H2) Gear		176 *(80.0)*	52 *(11.1)*	62 *(16.7)*	28.900 *(97.591)*
17.60 *(13.12)*	955 *(4.25)*	6.91 *(11.12)*	2498	6.80		11th (H3) Gear		177 *(80.6)*	57 *(13.9)*	69 *(20.6)*	28.880 *(97.523)*

LUGGING ABILITY IN 10th (H2) GEAR

Crankshaft Speed rpm	2498	2256	2001	1746	1493	1247
Pull—lbs *(kN)*	1278 *(5.68)*	1347 *(5.99)*	1431 *(6.37)*	1482 *(6.59)*	1536 *(6.83)*	1496 *(6.65)*
Increase in Pull %	0	5	12	16	20	17
Power—Hp *(kW)*	17.60 *(13.13)*	16.72 *(12.47)*	15.63 *(11.65)*	14.02 *(10.45)*	12.37 *(9.22)*	10.09 *(7.52)*
Speed—Mph *(km/h)*	5.17 *(8.32)*	4.65 *(7.49)*	4.09 *(6.59)*	3.55 *(5.71)*	3.02 *(4.86)*	2.53 *(4.07)*
Slip %	8.91	9.14	9.94	10.46	10.98	10.63

Department of Agricultural Engineering

Dates of Test: September 17 to October 2, 1980

Manufacturer: TOYOSHA COMPANY LTD, 55 Joshoji-16, Kadoma City, Osaka, Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8378 **Fuel weight** 6.976 lbs/gal *(0.836 kg/l)* **Oil SAE** 20-20W **API service classification** SB/SE-CA/CC **To motor** 1.082 gal *(4.095 l)* **Drained from motor** 1.059 gal *(4.009 l)* **Transmission and final drive lubricant** Massey Ferguson Permatran fluid **Total time engine was operated** 39.5 hours

ENGINE: Make Toyosha Diesel **Type** two cylinder vertical **Serial No.** S 126 MO 1949 **Crankshaft** lengthwise **Rated rpm** 2500 **Bore and stroke** 3.62" × 3.74" *(92 mm × 95 mm)* **Compression ratio** 23 to 1 **Displacement** 77.1 cu in *(1263 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** one paper element **Oil filter** one full flow paper cartridge **Fuel filter** one paper cartridge **Muffler** vertical **Cooling medium temperature control** one thermostat

CHASSIS: Type front wheel assist **Serial No.** 00553 **Tread width** rear 41.5" *(1055 mm)* to 53.3" *(1355 mm)* front 39.6" *(1005 mm)* **Wheel base** 59.4" *(1510 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 24.4" *(620 mm)* Vertical distance above roadway 28.6" *(726 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 0.3 *(0.5)* second 0.4 *(0.6)* third 0.5 *(0.8)* fourth 0.8 *(1.3)* fifth 1.0 *(1.6)* sixth 1.4 *(2.3)* seventh 1.8 *(2.9)* eighth 2.6 *(4.2)* ninth 4.0 *(6.4)* tenth 5.7 *(9.2)* eleventh 7.4 *(11.9)* twelfth 11.0 *(17.7)* reverse 0.6 *(1.0)*, 1.9 *(3.1)*, 7.8 *(12.6)* **Clutch** dry single disc operated by foot pedal **Brakes** drum and shoe operated by two foot pedals which can be locked together **Steering** mechanical **Turning radius** (on concrete surface with brake applied) right 93.3" *(2.37 m)* left 93.5" *(2.37 m)* (on concrete surface without brake) right 105.6" *(2.68 m)* left 111.4" *(2.83 m)* **Turning space diameter** (on concrete surface with brake applied) right 196.3" *(4.98 m)* left 196.5" *(4.99 m)* (on concrete surface without brake) right 221" *(5.61 m)* left 232.5" *(5.91 m)* **Power take-off** 540 rpm at 2326 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	94.5	94.0
75% of Pull at Maximum Power—Ten Hours		92.5
50% of Pull at Maximum Power—Two Hours		91.0
50% of Pull at Reduced Engine Speed—Two Hours		90.0
Bystander in 12th (H4) gear		78.0

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F (°C) Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 10th (H2) Gear											
17.22 *(12.84)*	1196 *(5.32)*	5.40 *(8.69)*	2499	6.49	1.684 *(6.376)*	0.682 *(0.415)*	10.23 *(2.014)*	176 *(79.7)*	61 *(15.8)*	75 *(23.9)*	28.815 *(97.304)*
MAXIMUM POWER IN SELECTED GEARS											
16.40 *(12.23)*	2596 *(11.55)*	2.37 *(3.81)*	2601	14.90	8th (M4) Gear			172 *(77.5)*	42 *(5.6)*	46 *(7.8)*	29.260 *(98.807)*
17.55 *(13.09)*	1218 *(5.42)*	5.40 *(8.70)*	2500	6.51	10th (H2) Gear			176 *(80.0)*	59 *(15.0)*	75 *(23.9)*	28.820 *(97.321)*

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 11.2/10-24; 4; 18 *(125)*	Two 11.2/10-24; 4; 18 *(125)*
Ballast	—Liquid (each)	280 lb *(127 kg)*	None
	—Cast Iron (each)	180 lb *(82 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 6-14; 4; 26 *(180)*	Two 6-14; 4; 26 *(180)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	55 lb *(25 kg)*	None
Height of Drawbar		14 in *(355 mm)*	14 in *(355 mm)*
Static Weight with Operator	—Rear	2575 lb *(1168 kg)*	1655 lb *(751 kg)*
	—Front	1190 lb *(540 kg)*	1080 lb *(490 kg)*
	—Total	3765 lb *(1708 kg)*	2735 lb *(1241 kg)*

142°F *(60.8°C)*. Four gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1366.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers

Massey-Ferguson MF210-4 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1367 — MASSEY-FERGUSON MF220 DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
	MAXIMUM POWER AND FUEL CONSUMPTION								
	Rated Engine Speed—Two Hours (PTO Speed—580 rpm)								
	26.37 *(19.66)*	2500	2.078 *(7.866)*	0.550 *(0.335)*	12.69 *(2.499)*	175 *(79.7)*	64 *(17.7)*	75 *(23.8)*	28.900 *(97.591)*
	Standard Power Take-off Speed (540 rpm)—One Hour								
	25.52 *(19.03)*	2327	1.911 *(7.234)*	0.522 *(0.318)*	13.36 *(2.631)*	175 *(79.6)*	64 *(17.8)*	75 *(23.9)*	28.900 *(97.591)*
	VARYING POWER AND FUEL CONSUMPTION—Two Hours								
	23.22 *(17.32)*	2589	1.707 *(6.462)*	0.513 *(0.312)*	13.60 *(2.680)*	173 *(78.3)*	64 *(17.8)*	75 *(23.9)*	....
	0.00 *(0.00)*	2713	0.598 *(2.264)*	....	....	168 *(75.6)*	64 *(17.8)*	76 *(24.4)*	....
	11.87 *(8.85)*	2646	1.088 *(4.119)*	0.639 *(0.389)*	10.91 *(2.149)*	171 *(77.2)*	64 *(17.8)*	75 *(23.9)*	....
	26.33 *(19.63)*	2500	2.073 *(7.847)*	0.549 *(0.334)*	12.70 *(2.502)*	176 *(80.0)*	64 *(17.8)*	75 *(23.9)*	....
	6.02 *(4.49)*	2680	0.856 *(3.240)*	0.993 *(0.604)*	7.03 *(1.386)*	169 *(76.1)*	64 *(17.8)*	76 *(24.2)*	....
	17.67 *(13.18)*	2626	1.365 *(5.160)*	0.538 *(0.327)*	12.96 *(2.554)*	173 *(78.3)*	64 *(17.8)*	75 *(23.9)*	....
Av ***Av***	**14.18** ***(10.57)***	**2625**	**1.281** ***(4.849)***	**0.630** ***(0.383)***	**11.07** ***(2.180)***	**172** ***(77.6)***	**64** ***(17.8)***	**75** ***(24.1)***	**28.873** ***(97.501)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 9th (H1) Gear											
22.73 *(16.95)*	1965 *(8.74)*	4.34 *(6.98)*	2498	8.30	2.025 *(7.665)*	0.622 *(0.378)*	11.22 *(2.211)*	173 *(78.3)*	54 *(11.9)*	64 *(17.5)*	29.025 *(98.013)*
75% of Pull at Maximum Power—Ten Hours 9th (H1) Gear											
19.00 *(14.17)*	1551 *(6.90)*	4.59 *(7.39)*	2593	6.36	1.638 *(6.200)*	0.601 *(0.366)*	11.60 *(2.285)*	172 *(78.0)*	52 *(11.3)*	65 *(18.2)*	29.014 *(97.976)*
50% of Pull at Maximum Power—Two Hours 9th (H1) Gear											
13.12 *(9.78)*	1035 *(4.60)*	4.75 *(7.65)*	2630	4.55	1.290 *(4.884)*	0.686 *(0.417)*	10.17 *(2.003)*	172 *(77.5)*	54 *(12.2)*	68 *(19.7)*	29.010 *(97.962)*
50% of Pull at Reduced Engine Speed—Two Hours 10th (H2) Gear											
13.09 *(9.76)*	1032 *(4.59)*	4.76 *(7.65)*	1863	4.34	1.003 *(3.798)*	0.535 *(0.325)*	13.04 *(2.570)*	168 *(75.6)*	54 *(11.9)*	69 *(20.6)*	29.010 *(97.962)*
MAXIMUM POWER IN SELECTED GEARS											
21.48 *(16.02)*	3287 *(14.62)*	2.45 *(3.94)*	2558	14.95	8th (M4) Gear			172 *(77.8)*	46 *(7.8)*	55 *(12.8)*	28.900 *(97.591)*
23.95 *(17.86)*	2068 *(9.20)*	4.34 *(6.99)*	2500	8.06	9th (H1) Gear			174 *(78.6)*	53 *(11.7)*	58 *(14.4)*	28.970 *(97.827)*
23.75 *(17.71)*	1415 *(6.29)*	6.29 *(10.13)*	2500	5.60	10th (H2) Gear			173 *(78.3)*	52 *(11.1)*	57 *(13.9)*	28.900 *(97.895)*
23.39 *(17.44)*	1051 *(4.67)*	8.35 *(13.44)*	2500	4.21	11th (H3) Gear			174 *(78.9)*	53 *(11.7)*	58 *(14.4)*	29.020 *(97.996)*

LUGGING ABILITY IN 9th (H1) GEAR

Crankshaft Speed rpm	2500	2254	2003	1752	1493	1247
Pull—lbs *(kN)*	2068 *(9.20)*	2150 *(9.56)*	2242 *(9.97)*	2229 *(9.91)*	2226 *(9.90)*	2083 *(9.27)*
Increase in Pull %	0	4	8	8	8	1
Power—Hp *(kW)*	23.95 *(17.86)*	22.37 *(16.68)*	20.61 *(15.37)*	17.91 *(13.36)*	15.27 *(11.38)*	12.01 *(8.95)*
Speed—Mph *(km/h)*	4.34 *(6.99)*	3.90 *(6.28)*	3.45 *(5.55)*	3.01 *(4.85)*	2.57 *(4.14)*	2.16 *(3.48)*
Slip %	8.06	8.59	8.97	9.06	8.87	8.30

Department of Agricultural Engineering

Dates of Test: September 15 to 26, 1980

Manufacturer: TOYOSHA COMPANY LTD, 55 Joshoji-16, Kadoma City, Osaka Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8378 **Fuel weight** 6.976 lbs/gal *(0.836 kg/l)* **Oil SAE** 20-20W **API service classification** SB/SE-CA/CC **To motor** 0.953 gal *(3.606 l)* **Drained from motor** 0.735 gal *(2.783 l)* **Transmission and final drive lubricant** Massey Ferguson Permatran fluid **Total time engine was operated** 41.0 hours

ENGINE: Make Toyosha Diesel **Type** two cylinder vertical **Serial No.** S 148 MO 0199 **Crankshaft** lengthwise **Rated rpm** 2500 **Bore and stroke** 3.82" × 3.94" *(97 mm × 100 mm)* **Compression ratio** 23 to 1 **Displacement** 90.3 cu in *(1480 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** one paper element **Oil filter** one full flow paper cartridge **Fuel filter** one paper cartridge **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type standard **Serial No.** 00224 **Tread width** rear 40.9" *(1040 mm)* to 62.5" *(1588 mm)* front 40.9" *(1040 mm)* to 51.2" *(1300 mm)* **Wheel base** 61.6" *(1565 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 22.6" *(574 mm)* Vertical distance above roadway 26.6" *(676 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 0.3 *(0.5)* second 0.4 *(0.6)* third 0.5 *(0.8)* fourth 0.9 *(1.4)* fifth 1.0 *(1.6)* sixth 1.5 *(2.4)* seventh 1.9 *(3.1)* eighth 2.8 *(4.5)* ninth 4.7 *(7.6)* tenth 6.7 *(10.8)* eleventh 8.8 *(14.2)* twelfth 14.0 *(22.5)* reverse 0.6 *(1.0)*, 2.0 *(3.2)*, 9.2 *(14.8)* **Clutch** dry single disc operated by foot pedal **Brakes** drum and shoe operated by two foot pedals which can be locked together **Steering** mechanical **Turning radius** (on concrete surface with brake applied) right 90.3" *(2.29 m)* left 91.0" *(2.31 m)* (on concrete surface without brake) right 108.6" *(2.76 m)* left 106.8" *(2.71 m)* **Turning space diameter** (on concrete surface with brake applied) right 189" *(4.80 m)* left 190.5" *(4.84 m)* (on concrete surface without brake) right 225.8" *(5.73 m)* left 222" *(5.64 m)* **Power take-off** 540 rpm at 2327 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	93.5
75% of Pull at Maximum Power—Ten Hours	93.5
50% of Pull at Maximum Power—Two Hours	92.0
50% of Pull at Reduced Engine Speed—Two Hours	90.0
Bystander in 12th (H4) gear	79.5

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 12.4-24; 4; 16 *(110)*	Two 12.4-24; 4; 16 *(110)*
Ballast	—Liquid (each)	380 lb *(172 kg)*	None
	—Cast Iron (each)	297 lb *(135 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 5.00-15; 4; 36 *(250)*	Two 5.00-15; 4; 36 *(250)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	50 lb *(23 kg)*	None
Height of Drawbar		14 in *(355 mm)*	14 in *(355 mm)*
Static Weight with Operator	—Rear	3140 lb *(1424 kg)*	1785 lb *(810 kg)*
	—Front	1080 lb *(490 kg)*	980 lb *(444 kg)*
	—Total	4220 lb *(1914 kg)*	2765 lb *(1254 kg)*

procedure. Temperature at injection pump was 138°F *(59.0°C)*. Four gears were chosen between 15% slip and 10 mph *(16.1 km/h)*. Both cylinder walls were found to be scratched during final inspection.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1367.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers

Massey-Ferguson MF220 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1368 —MASSEY-FERGUSON MF220-4 DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—580 rpm)									
	26.48 *(19.75)*	2500	1.929 *(7.302)*	0.508 *(0.309)*	13.72 *(2.705)*	174 *(78.9)*	59 *(14.9)*	75 *(23.9)*	29.183 *(98.548)*
Standard Power Take-off Speed (540 rpm)—One Hour									
	26.06 *(19.43)*	2326	1.849 *(6.999)*	0.495 *(0.301)*	14.09 *(2.776)*	173 *(78.6)*	58 *(14.5)*	75 *(23.9)*	29.175 *(98.520)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	22.87 *(17.05)*	2541	1.643 *(6.219)*	0.501 *(0.305)*	13.92 *(2.742)*	172 *(77.8)*	58 *(14.4)*	75 *(23.9)*	....
	0.00 *(0.00)*	2687	0.581 *(2.199)*	....	....	164 *(73.3)*	58 *(14.4)*	75 *(23.9)*	....
	11.78 *(8.78)*	2615	1.049 *(3.971)*	0.622 *(0.378)*	11.22 *(2.211)*	169 *(76.1)*	58 *(14.4)*	75 *(23.9)*	......
	26.76 *(19.95)*	2500	1.918 *(7.260)*	0.500 *(0.304)*	13.95 *(2.748)*	174 *(78.6)*	58 *(14.4)*	76 *(24.2)*	....
	5.96 *(4.44)*	2650	0.821 *(3.108)*	0.962 *(0.585)*	7.25 *(1.429)*	166 *(74.4)*	57 *(13.9)*	75 *(23.9)*	....
	17.42 *(12.99)*	2580	1.320 *(4.997)*	0.529 *(0.322)*	13.20 *(2.600)*	170 *(76.7)*	57 *(13.9)*	75 *(23.9)*	....
Av ***Av***	**14.13** ***(10.54)***	**2596**	**1.222** ***(4.626)***	**0.603** ***(0.367)***	**11.56** ***(2.278)***	**169** ***(76.2)***	**58** ***(14.3)***	**75** ***(23.9)***	**29.160** ***(98.469)***

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 9th (H1) Gear											
20.87 *(15.56)*	2031 *(9.03)*	3.85 *(6.20)*	2501	8.10	1.881 *(7.122)*	0.629 *(0.383)*	11.09 *(2.185)*	174 *(78.9)*	55 *(12.8)*	72 *(22.2)*	28.890 *(97.557)*
75% of Pull at Maximum Power—Ten Hours 9th (H1) Gear											
17.96 *(13.39)*	1673 *(7.44)*	4.03 *(6.48)*	2562	6.25	1.555 *(5.888)*	0.604 *(0.367)*	11.55 *(2.275)*	168 *(75.6)*	48 *(8.9)*	60 *(15.7)*	29.032 *(98.037)*
50% of Pull at Maximum Power—Two Hours 9th (H1) Gear											
12.57 *(9.37)*	1123 *(5.00)*	4.20 *(6.75)*	2621	4.43	1.254 *(4.748)*	0.696 *(0.423)*	10.02 *(1.974)*	162 *(72.2)*	39 *(3.9)*	45 *(6.9)*	28.985 *(97.878)*
50% of Pull at Reduced Engine Speed—Two Hours 10th (H2) Gear											
12.55 *(9.36)*	1119 *(4.98)*	4.20 *(6.77)*	1859	4.30	1.021 *(3.866)*	0.568 *(0.345)*	12.28 *(2.420)*	164 *(73.3)*	46 *(7.8)*	57 *(13.6)*	28.865 *(97.473)*
MAXIMUM POWER IN SELECTED GEARS											
21.78 *(16.24)*	3496 *(15.55)*	2.34 *(3.76)*	2511	14.90	8th (M4) Gear			167 *(74.7)*	36 *(2.2)*	40 *(4.4)*	29.020 *(97.996)*
22.91 *(17.09)*	2235 *(9.94)*	3.84 *(6.19)*	2499	8.24	9th (H1) Gear			174 *(78.6)*	55 *(12.8)*	66 *(18.9)*	28.820 *(97.321)*
22.82 *(17.02)*	1529 *(6.80)*	5.60 *(9.01)*	2501	5.30	10th (H2) Gear			173 *(78.1)*	56 *(13.3)*	69 *(20.6)*	28.870 *(97.490)*
22.18 *(16.54)*	1121 *(4.99)*	7.42 *(11.94)*	2499	3.97	11th (H3) Gear			173 *(78.3)*	56 *(13.3)*	69 *(20.6)*	28.870 *(97.490)*

LUGGING ABILITY IN 9th (H1) GEAR

Crankshaft Speed rpm	2499	2254	1998	1738	1496	1244
Pull—lbs *(kN)*	2235 *(9.94)*	2334 *(10.38)*	2413 *(10.73)*	2444 *(10.87)*	2438 *(10.84)*	2289 *(10.18)*
Increase in Pull %	0	4	8	9	9	2
Power—Hp *(kW)*	22.91 *(17.09)*	21.45 *(15.99)*	19.57 *(14.60)*	17.22 *(12.84)*	14.97 *(11.03)*	11.62 *(8.66)*
Speed—Mph *(km/h)*	3.84 *(6.19)*	3.45 *(5.55)*	3.04 *(4.90)*	2.64 *(4.25)*	2.28 *(3.66)*	1.90 *(3.06)*
Slip %	8.24	8.86	9.23	9.42	9.32	8.67

Department of Agricultural Engineering

Dates of Test: September 18 to October 7, 1980

Manufacturer: TOYOSHA COMPANY LTD, 55 Joshoji-16, Kadoma City, Osaka Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** ***(15°/15°)*** 0.8378 **Fuel weight** 6.976 lbs/gal *(0.836 kg/l)* **Oil SAE** 20-20W **API service classification** SB/SE-CA/CC **To motor** 1.111 gal *(4.206 l)* **Drained from motor** 0.955 gal *(3.614 l)* **Transmission and final drive lubricant** Massey Ferguson Permatran fluid **Total time engine was operated** 39.0 hours

ENGINE: Make Toyosha Diesel **Type** two cylinder vertical **Serial No.** S 148 MO 1294 **Crankshaft** lengthwise **Rated rpm** 2500 **Bore and stroke** 3.82″ × 3.94″ *(97 mm × 100 mm)* **Compression ratio** 23 to 1 **Displacement** 90.3 cu in *(1480 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** one paper element **Oil filter** one full flow paper cartridge **Fuel filter** one paper cartridge **Muffler** vertical **Cooling medium temperature control** one thermostat

CHASSIS: Type front wheel assist **Serial No.** 00624 **Tread width** rear 40.9″ *(1040 mm)* to 62.5″ *(1588 mm)* front 44.9″ *(1140 mm)* **Wheel base** 62.6″ *(1590 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 26.0″ *(660 mm)* Vertical distance above roadway 28.1″ *(714 mm)* Horizontal distance from center of rear wheel tread 0″ *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 0.3 *(0.5)* second 0.4 *(0.6)* third 0.6 *(1.0)* fourth 0.9 *(1.4)* fifth 1.0 *(1.6)* sixth 1.4 *(2.3)* seventh 1.9 *(3.1)* eighth 2.8 *(4.5)* ninth 4.2 *(6.8)* tenth 6.0 *(9.7)* eleventh 7.8 *(12.6)* twelfth 11.6 *(18.7)* reverse 0.6 *(1.0)*, 2.0 *(3.2)*, 8.2 *(13.2)* **Clutch** dry disc operated by foot pedal **Brakes** drum and shoe operated by two foot pedals which can be locked together **Steering** mechanical **Turning radius** (on concrete surface with brake applied) right 93.9″ *(2.38 m)* left 94.0″ *(2.39 m)* (on concrete surface without brake) right 111.3″ *(2.83 m)* left 112.6″ *(2.86 m)* **Turning space diameter** (on concrete surface with brake applied) right 203.8″ *(5.18 m)* left 204″ *(5.18 m)* (on concrete surface without brake) right 237.5″ *(6.03 m)* left 240.3″ *(6.10 m)* **Power take-off** 540 rpm at 2326 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	92.5	92.5
75% of Pull at Maximum Power—Ten Hours		91.5
50% of Pull at Maximum Power—Two Hours		93.0
50% of Pull at Reduced Engine Speed—Two Hours		89.5
Bystander in 12th (H4) gear		79.0

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F (°C) Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 9th (H1) Gear											
21.45 *(16.00)*	2018 *(8.98)*	3.99 *(6.42)*	2500	6.78	1.935 *(7.326)*	0.629 *(0.383)*	11.09 *(2.184)*	175 *(79.2)*	54 *(11.9)*	72 *(22.2)*	28.900 *(97.591)*
MAXIMUM POWER IN SELECTED GEARS											
17.48 *(13.03)*	3973 *(17.67)*	1.65 *(2.65)*	2577	14.91		7th (M3) Gear		162 *(72.2)*	35 *(1.7)*	37 *(2.8)*	29.040 *(98.064)*
22.52 *(16.79)*	2117 *(9.42)*	3.99 *(6.42)*	2499	6.68		9th (H1) Gear		173 *(78.3)*	56 *(13.3)*	68 *(20.0)*	28.870 *(97.490)*

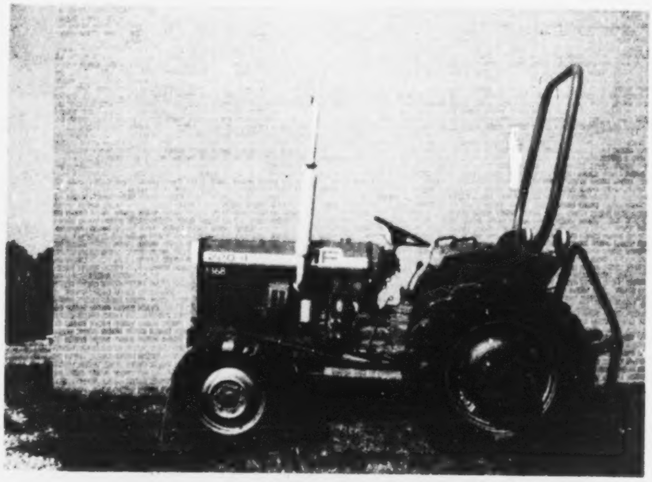
TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 12.4-24; 4; 16 *(110)*	Two 12.4-24; 4; 16 *(110)*
Ballast	—Liquid (each)	380 lb *(172 kg)*	None
	—Cast Iron (each)	224 lb *(101 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 7-16; 4; 26 *(180)*	Two 7-16; 4; 26 *(180)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	50 lb *(23 kg)*	None
Height of Drawbar		14 in *(355 mm)*	14 in *(355 mm)*
Static Weight with Operator	—Rear	3112 lb *(1411 kg)*	1905 lb *(864 kg)*
	—Front	1375 lb *(624 kg)*	1275 lb *(578 kg)*
	—Total	4487 lb *(2035 kg)*	3180 lb *(1442 kg)*

136°F *(57.6°C)*. Four gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1368.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers



Massey-Ferguson MF220-4 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1369 — KUBOTA M5500 DT DIESEL
ALSO KUBOTA M5500 DIESEL
16 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F (°C) Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—643 rpm)								
53.99 *(40.26)*	2400	3.516 *(13.310)*	0.454 *(0.276)*	15.35 *(3.025)*	200 *(93.3)*	58 *(14.6)*	75 *(23.8)*	28.803 *(97.265)*
Standard Power Take-off Speed (540 rpm)—One Hour								
49.18 *(36.67)*	2015	3.032 *(11.477)*	0.430 *(0.262)*	16.22 *(3.195)*	201 *(93.7)*	58 *(14.3)*	75 *(23.9)*	28.830 *(97.355)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
47.57 *(35.47)*	2488	3.126 *(11.833)*	0.459 *(0.279)*	15.21 *(2.998)*	190 *(87.5)*	58 *(14.4)*	76 *(24.4)*	....
0.00 *(0.00)*	2578	1.333 *(5.046)*	....	....	180 *(81.9)*	58 *(14.4)*	75 *(23.6)*	....
24.36 *(18.17)*	2548	1.983 *(7.506)*	0.568 *(0.345)*	12.29 *(2.421)*	186 *(85.3)*	59 *(14.7)*	75 *(23.9)*	......
54.72 *(40.80)*	2400	3.544 *(13.416)*	0.452 *(0.275)*	15.44 *(3.041)*	195 *(90.3)*	59 *(14.7)*	75 *(23.9)*	....
12.26 *(9.14)*	2566	1.595 *(6.038)*	0.908 *(0.552)*	7.68 *(1.514)*	180 *(81.9)*	59 *(15.0)*	76 *(24.4)*	....
36.19 *(26.99)*	2524	2.494 *(9.441)*	0.481 *(0.293)*	14.51 *(2.859)*	[illegible] *(85.8)*	59 *(15.0)*	77 *(25.0)*	....
Av 29.18 ***Av (21.76)***	**2517**	**2.346** ***(8.881)***	**0.561** ***(0.341)***	**12.44** ***(2.450)***	**186** ***(85.4)***	**59** ***(14.7)***	**76** ***(24.2)***	**28.845** ***(97.405)***

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F (°C) Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 13th (HH1) Gear											
45.12 *(33.65)*	3068 *(13.65)*	5.52 *(8.88)*	2400	6.18	3.458 *(13.091)*	0.535 *(0.325)*	13.05 *(2.570)*	196 *(90.8)*	60 *(15.3)*	83 *(28.1)*	28.810 *(97.287)*
75% of Pull at Maximum Power—Ten Hours 13th (HH1) Gear											
37.66 *(28.08)*	2401 *(10.68)*	5.88 *(9.47)*	2511	4.31	2.949 *(11.165)*	0.546 *(0.332)*	12.77 *(2.515)*	184 *(84.7)*	48 *(8.6)*	64 *(17.8)*	29.040 *(98.064)*
50% of Pull at Maximum Power—Two Hours 13th (HH1) Gear											
25.75 *(19.20)*	1602 *(7.12)*	6.03 *(9.70)*	2540	3.01	2.329 *(8.818)*	0.631 *(0.384)*	11.05 *(2.177)*	179 *(81.7)*	47 *(8.1)*	59 *(15.0)*	29.155 *(98.452)*
50% of Pull at Reduced Engine Speed—Two Hours 14th (HH2) Gear											
25.82 *(19.25)*	1601 *(7.12)*	6.05 *(9.73)*	2090	2.91	2.007 *(7.597)*	0.542 *(0.330)*	12.87 *(2.534)*	179 *(81.4)*	48 *(8.6)*	63 *(16.9)*	29.110 *(98.300)*

MAXIMUM POWER IN SELECTED GEARS

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %		Gear		Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
41.45 *(30.91)*	6287 *(27.97)*	2.47 *(3.98)*	2469	14.92		10th (LH4) Gear		182 *(83.3)*	41 *(5.0)*	49 *(9.4)*	29.140 *(98.401)*
44.08 *(32.87)*	5883 *(26.17)*	2.81 *(4.52)*	2400	12.76		11th (HL3) Gear		185 *(85.0)*	45 *(7.2)*	56 *(13.3)*	29.160 *(98.469)*
45.50 *(33.93)*	4242 *(18.87)*	4.02 *(6.47)*	2402	8.55		12th (HL4) Gear		189 *(87.2)*	58 *(14.4)*	76 *(24.4)*	28.840 *(97.388)*
46.96 *(35.02)*	3197 *(14.22)*	5.51 *(8.87)*	2400	6.29		13th (HH1) Gear		186 *(85.6)*	53 *(11.7)*	65 *(18.3)*	28.860 *(97.456)*
46.38 *(34.58)*	2559 *(11.38)*	6.80 *(10.94)*	2401	4.97		14th (HH2) Gear		191 *(88.1)*	58 *(14.4)*	78 *(25.6)*	28.840 *(97.388)*

LUGGING ABILITY IN 13th (HH1) GEAR

Crankshaft Speed rpm	2400	2159	1911	1679	1442	1189	953
Pull—lbs *(kN)*	3197 *(14.22)*	3387 *(15.07)*	3511 *(15.62)*	3623 *(16.12)*	3782 *(16.82)*	3865 *(17.19)*	3784 *(16.83)*
Increase in Pull %	0	6	10	13	18	21	18
Power—Hp *(kW)*	46.96 *(35.02)*	44.58 *(33.24)*	40.76 *(30.39)*	36.81 *(27.45)*	32.84 *(24.49)*	27.63 *(20.61)*	21.72 *(16.20)*
Speed—Mph *(km/h)*	5.51 *(8.87)*	4.94 *(7.94)*	4.35 *(7.01)*	3.81 *(6.13)*	3.26 *(5.24)*	2.68 *(4.31)*	2.15 *(3.46)*
Slip %	6.29	6.59	7.06	7.29	7.64	7.87	7.75

Department of Agricultural Engineering

Dates of Test: October 4-16, 1980

Manufacturer: KUBOTA, LTD., 2-47 Shikitsu-Higashi 1-chome Naniwa-ku, Osaka Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** ***(15°/15°)*** 0.8378 **Fuel weight** 6.976 lbs/gal *(0.836 kg/l)* **Oil SAE** 20-20W **API service classification** SB/SE-CA/CD **To motor** 2.262 gal *(8.564 l)* **Drained from motor** 2.124 gal *(8.041 l)* **Transmission and final drive lubricant** SAE 80 or tractor hydraulic fluid **Front axle lubricant** SAE 80/90 **Total time engine was operated** 40.0 hours

ENGINE: Make Kubota Diesel **Type** three cylinder vertical **Serial No.** D3000-A-5549 **Crankshaft** lengthwise **Rated rpm** 2400 **Bore and stroke** 4.134" × 4.528" *(105 mm × 115 mm)* **Compression ratio** 17.0 to 1 **Displacement** 182 cu in *(2987 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** one paper element **Oil filter** one full flow paper cartridge **Fuel filter** two paper elements **Muffler** vertical **Cooling medium temperature control** one thermostat

CHASSIS: Type front wheel assist **Serial No.** M5500DT-10503 **Tread width** rear 51.2" *(1300 mm)* to 74.8" *(1900 mm)* front 57.1" *(1450 mm)* **Wheel base** 80.9" *(2055 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 36.5" *(928 mm)* Vertical distance above roadway 36.4" *(925 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph** ***(km/h)*** first 0.3 *(0.4)* second 0.3 *(0.5)* third 0.6 *(0.9)* fourth 0.8 *(1.2)* fifth 1.0 *(1.6)* sixth 1.2 *(2.0)* seventh 1.7 *(2.7)* eighth 2.0 *(3.3)* ninth 2.1 *(3.4)* tenth 2.7 *(4.4)* eleventh 3.4 *(5.5)* twelfth 4.7 *(7.5)* thirteenth 6.2 *(10.0)* fourteenth 7.6 *(12.2)* fifteenth 12.8 *(20.5)* sixteenth 17.4 *(28.0)* reverse 0.4 *(0.6)*, 1.4 *(2.3)*, 2.2 *(3.5)*, 8.2 *(13.2)* **Clutch** dry single disc operated by foot pedal **Brakes** wet multiple disc operated by two foot pedals which can be locked together and hand lever **Steering** power assist **Turning radius** (on concrete surface with brake applied) right 135.8" *(3..45 m)* left 135.8" *(3.45 m)* (on concrete surface without brake) right 161.4" *(4.10 m)* left 161.4" *(4.10 m)* **Turning space diameter** (on concrete surface with brake applied) right 271.7" *(6.90 m)* left 272.4" *(6.92 m)* (on concrete surface without brake) right 322.8" *(8.20 m)* left 322.8" *(8.20 m)* **Power take-off** 540 rpm at 2015 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	94.5	94.0
75% of Pull at Maximum Power—Ten Hours		94.0
50% of Pull at Maximum Power—Two Hours		93.0
50% of Pull at Reduced Engine Speed—Two Hours		90.5
Bystander in 16th (HH4) gear		83.5

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F *(°C)*			Barom. inch Hg *(kPa)*
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 13th (HH1) Gear											
44.06 *(32.86)*	2885 *(12.84)*	5.73 *(9.22)*	2400	4.51	3.422 *(12.955)*	0.542 *(0.330)*	12.87 *(2.536)*	199 *(92.5)*	61 *(16.1)*	87 *(30.3)*	28.785 *(97.203)*
MAXIMUM POWER IN SELECTED GEARS											
35.76 *(26.66)*	7751 *(34.48)*	1.73 *(2.78)*	2501	14.96		8th (HL2) Gear		179 *(81.4)*	38 *(3.3)*	46 *(7.8)*	29.130 *(98.368)*
45.81 *(34.16)*	3007 *(13.38)*	5.71 *(9.19)*	2399	4.60		13th (HH1) Gear		188 *(86.4)*	55 *(12.8)*	71 *(21.7)*	28.850 *(97.422)*

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 16.9-28; 6; 18 *(125)*	Two 16.9-28; 6; 18 *(125)*
Ballast	—Liquid (each)	700 lb *(318 kg)*	None
	—Cast Iron (each)	470 lb *(213 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 9.5-24; 6; 20 *(140)*	Two 9.5-24; 6; 20 *(140)*
Ballast	—Liquid (each)	180 lb *(81 kg)*	None
	—Cast Iron (each)	255 lb *(116 kg)*	None
Height of Drawbar		19.5 in *(495 mm)*	19.5 in *(495 mm)*
Static Weight with Operator	—Rear	5550 lb *(2518 kg)*	3210 lb *(1456 kg)*
	—Front	3160 lb *(1433 kg)*	2290 lb *(1039 kg)*
	—Total	8710 lb *(3951 kg)*	5500 lb *(2495 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 157°F *(69.3°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*. This tractor did not meet manufacturer's claim of 55.3 HP *(41.25 kw)* PTO power.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1369**.

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers

Kubota M5500 DT Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1370 — KUBOTA L295 DT DIESEL
ALSO KUBOTA L295 DIESEL
8 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F (°C) Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—622 rpm)									
	26.46	2800	1.891	0.499	13.99	224	59	75	28.857
	(19.73)		*(7.158)*	*(0.303)*	*(2.756)*	*(106.7)*	*(14.9)*	*(23.9)*	*(97.445)*
Standard Power Take-off Speed (540 rpm)—One Hour									
	24.91	2430	1.707	0.478	14.59	222	59	75	28.840
	(18.58)		*(6.462)*	*(0.291)*	*(2.875)*	*(105.7)*	*(14.8)*	*(24.1)*	*(97.388)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	22.95	2854	1.617	0.492	14.19	200	60	77	......
	(17.11)		*(6.121)*	*(0.299)*	*(2.795)*	*(93.3)*	*(15.3)*	*(25.0)*	......
	0.00	3028	0.546	.....	.....	184	60	79	......
	(0.00)		*(2.067)*	.....	.....	*(84.4)*	*(15.6)*	*(25.8)*	......
	11.79	2935	1.036	0.613	11.38	189	60	79	......
	(8.79)		*(3.922)*	*(0.373)*	*(2.241)*	*(86.9)*	*(15.6)*	*(26.1)*	
	26.64	2802	1.927	0.504	13.83	216	61	80	......
	(19.87)		*(7.294)*	*(0.307)*	*(2.724)*	*(101.9)*	*(15.8)*	*(26.4)*	......
	5.95	2964	0.770	0.903	7.73	185	61	81	......
	(4.44)		*(2.915)*	*(0.549)*	*(1.523)*	*(85.0)*	*(16.1)*	*(27.2)*	......
	17.52	2906	1.325	0.528	13.22	191	62	81	......
	(13.06)		*(5.016)*	*(0.321)*	*(2.604)*	*(88.3)*	*(16.7)*	*(27.2)*	......
Av	**14.14**	**2915**	**1.203**	**0.594**	**11.75**	**194**	**61**	**79**	**28.827**
Av	***(10.54)***		***(4.554)***	***(0.361)***	***(2.314)***	***(90.0)***	***(15.8)***	***(26.3)***	***(97.343)***

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F (°C) Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 6th (H2) Gear											
21.56	1860	4.35	2800	8.34	1.864	0.603	11.57	198	54	69	28.820
(16.08)	*(8.27)*	*(6.99)*			*(7.054)*	*(0.367)*	*(2.279)*	*(91.9)*	*(12.2)*	*(20.6)*	*(97.321)*
75% of Pull at Maximum Power—Ten Hours 6th (H2) Gear											
18.16	1480	4.60	2908	6.55	1.595	0.613	11.39	189	52	53	28.753
(13.54)	*(6.58)*	*(7.41)*			*(6.037)*	*(0.373)*	*(2.243)*	*(87.3)*	*(10.9)*	*(11.9)*	*(97.095)*
50% of Pull at Maximum Power—Two Hours 6th (H2) Gear											
12.53	991	4.74	2940	4.84	1.308	0.728	9.58	187	60	62	28.430
(9.34)	*(4.41)*	*(7.63)*			*(4.952)*	*(0.443)*	*(1.887)*	*(85.8)*	*(15.3)*	*(16.4)*	*(96.004)*
50% of Pull at Reduced Engine Speed—Two Hours•7th (H3) Gear											
12.63	994	4.77	2050	4.42	1.057	0.584	11.95	187	63	69	28.360
(9.42)	*(4.42)*	*(7.67)*			*(4.002)*	*(0.355)*	*(2.353)*	*(86.1)*	*(17.2)*	*(20.6)*	*(95.767)*
MAXIMUM POWER IN SELECTED GEARS											
21.29	3155	2.53	2829	14.98		4th (L4) Gear		198	52	65	28.840
(15.87)	*(14.03)*	*(4.07)*						*(91.9)*	*(11.1)*	*(18.3)*	*(97.388)*
22.02	2547	3.24	2799	11.05		5th (H1) Gear		198	50	62	28.860
(16.42)	*(11.33)*	*(5.22)*						*(91.9)*	*(10.0)*	*(16.7)*	*(97.456)*
22.82	1969	4.34	2800	8.48		6th (H2) Gear		191	46	54	28.840
(17.02)	*(8.76)*	*(6.99)*						*(88.1)*	*(7.8)*	*(12.2)*	*(97.388)*
21.93	1281	6.42	2800	5.71		7th (H3) Gear		194	51	63	28.850
(16.36)	*(5.70)*	*(10.33)*						*(90.0)*	*(10.6)*	*(17.2)*	*(97.422)*

LUGGING ABILITY IN 6th (H2) GEAR

Crankshaft Speed rpm	2800	2529	2236	1956	1676	1393	1112
Pull—lbs	1969	2087	2216	2245	2314	2338	2171
(kN)	*(8.76)*	*(9.28)*	*(9.86)*	*(9.99)*	*(10.29)*	*(10.40)*	*(9.66)*
Increase in Pull %	0	6	13	14	18	19	10
Power—Hp	22.82	21.70	20.23	17.91	15.75	13.21	9.87
(kW)	*(17.02)*	*(16.18)*	*(15.09)*	*(13.35)*	*(11.75)*	*(9.85)*	*(7.36)*
Speed—Mph	4.34	3.90	3.42	2.99	2.55	2.12	1.71
(km/h)	*(6.99)*	*(6.28)*	*(5.51)*	*(4.81)*	*(4.11)*	*(3.41)*	*(2.75)*
Slip %	8.48	8.99	9.62	9.81	10.16	10.25	9.44

Department of Agricultural Engineering

Dates of Test: October 7-17, 1980

Manufacturer: KUBOTA, LTD., 2-47 Shikitsu-Higashi 1-chome Naniwa-ku, Osaka Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** ***(15°/15°)*** 0.8378 **Fuel weight** 6.976 lbs/gal *(0.836 kg/l)* **Oil SAE** 20-20W **API service classification** SB/SE-CA/CD **To motor** 1.465 gal *(5.546 l)* **Drained from motor** 1.355 gal *(5.129 l)* **Transmission and final drive lubricant** SAE 80 or tractor hydraulic fluid **Front axle lubricant** SAE 90 **Total time engine was operated** 44.0 hours

ENGINE: Make Kubota Diesel **Type** three cylinder vertical **Serial No.** D1301-A-05606 **Crankshaft** lengthwise **Rated rpm** 2800 **Bore and stroke** 3.23" × 3.23" *(82 mm × 82 mm)* **Compression ratio** 21 to 1 **Displacement** 79.3 cu in *(1299 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** one paper element **Oil filter** one full flow paper cartridge **Fuel filter** one paper cartridge **Muffler** horizontal **Cooling medium temperature control** one thermostat

CHASSIS: Type front wheel assist **Serial No.** L295DT-13670 **Tread width** rear 44.1" *(1120 mm)* to 58.7" *(1490 mm)* front 43.3" *(1100 mm)* **Wheel base** 65.4" *(1660 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 30.5" *(774 mm)* Vertical distance above roadway 31.7" *(805 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph** ***(km/h)*** first 0.9 *(1.4)* second 1.1 *(1.8)* third 1.6 *(2.6)* fourth 3.0 *(4.9)* fifth 3.8 *(6.0)* sixth 4.9 *(7.8)* seventh 7.0 *(11.3)* eighth 13.1 *(21.0)* reverse 1.5 *(2.4)*, 6.4 *(10.3)* **Clutch** dry single disc operated by foot pedal **Brakes** wet disc operated by two foot pedals which can be locked together **Steering** mechanical **Turning radius** (on concrete surface with brake applied) right 98.3" *(2.50 m)* left 98.3" *(2.50 m)* (on concrete surface without brake) right 130" *(3.30 m)* left 130" *(3.30 m)* **Turning space diameter** (on concrete surface with brake applied) right 201" *(5.10 m)* left 201" *(5.10 m)* (on concrete surface without brake) right 264" *(6.70 m)* left 264" *(6.70 m)* **Power take-off** 540 rpm at 2430 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 150°F *(65.8°C)*. Four gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	94.5	95.5
75% of Pull at Maximum Power—Ten Hours		94.0
50% of Pull at Maximum Power—Two Hours		91.5
50% of Pull at Reduced Engine Speed—Two Hours		89.5
Bystander in 8th (H4) gear		81.5

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

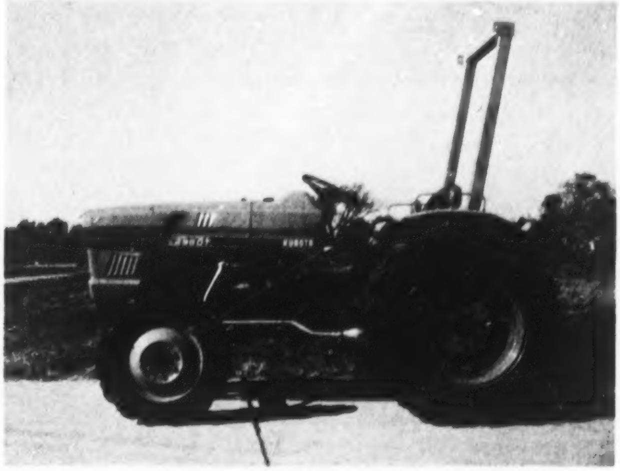
Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F (°C)			Barom. inch Hg (kPa)
					gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Cooling med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 6th (H2) Gear											
21.09 (15.73)	1754 (7.80)	4.51 (7.26)	2800	6.67	1.828 (6.919)	0.604 (0.368)	11.54 (2.273)	203 (94.7)	56 (13.1)	73 (22.8)	28.800 (97.253)
MAXIMUM POWER IN SELECTED GEARS											
13.33 (9.94)	3484 (15.50)	1.43 (2.31)	2938	14.85		3rd (L3) Gear		187 (85.8)	44 (6.7)	51 (10.6)	28.830 (97.355)
22.76 (16.97)	1894 (8.43)	4.50 (7.25)	2800	6.75		6th (H2) Gear		192 (88.9)	49 (9.4)	59 (15.0)	28.860 (97.456)

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi (kPa)	Two 12.4-24; 6; 16 (110)	Two 12.4-24; 6; 16 (110)
Ballast	—Liquid (each)	312 lb (142 kg)	None
	—Cast Iron (each)	480 lb (218 kg)	None
Front Tires	—No., size, ply & psi (kPa)	Two 7-16; 4; 26 (180)	Two 7-16; 4; 26 (180)
Ballast	—Liquid (each)	42 lb (19 kg)	None
	—Cast Iron (each)	68 lb (31 kg)	None
Height of Drawbar		18.5 in (470 mm)	18.5 in (470 mm)
Static Weight with Operator	—Rear	3270 lb (1483 kg)	1685 lb (764 kg)
	—Front	1430 lb (649 kg)	1210 lb (549 kg)
	—Total	4700 lb (2132 kg)	2895 lb (1313 kg)

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1370.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers



Kubota L295 DT Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1371 — KUBOTA L305 DT DIESEL
ALSO KUBOTA L305 DIESEL
8 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temperature °F (°C) Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg (kPa)
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—597 rpm)									
	26.21 *(19.54)*	2800	1.979 *(7.491)*	0.527 *(0.320)*	13.24 *(2.608)*	215 *(101.6)*	58 *(14.2)*	75 *(23.8)*	28.830 *(97.355)*
Standard Power Take-off Speed (540 rpm)—One Hour									
	25.14 *(18.75)*	2534	1.818 *(6.882)*	0.504 *(0.307)*	13.83 *(2.724)*	214 *(101.2)*	58 *(14.4)*	75 *(23.7)*	28.845 *(97.405)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	22.74 *(16.96)*	2858	1.677 *(6.348)*	0.515 *(0.313)*	13.56 *(2.672)*	202 *(94.2)*	58 *(14.4)*	75 *(23.9)*	....
	0.00 *(0.00)*	3034	0.598 *(2.264)*	....	....	184 *(84.2)*	58 *(14.4)*	75 *(23.9)*	....
	11.77 *(8.78)*	2960	1.088 *(4.119)*	0.645 *(0.392)*	10.82 *(2.132)*	189 *(87.2)*	58 *(14.4)*	75 *(23.9)*	......
	26.36 *(19.66)*	2800	1.995 *(7.552)*	0.528 *(0.321)*	13.21 *(2.603)*	212 *(99.7)*	58 *(14.4)*	75 *(23.6)*	....
	5.98 *(4.46)*	3003	0.839 *(3.176)*	0.978 *(0.595)*	7.14 *(1.404)*	185 *(85.0)*	59 *(15.0)*	75 *(23.9)*	....
	17.49 *(13.04)*	2930	1.376 *(5.209)*	0.549 *(0.334)*	12.71 *(2.503)*	191 *(88.3)*	59 *(15.0)*	75 *(23.6)*	....
Av ***Av***	**14.06** ***(10.48)***	**2931**	**1.262** ***(4.777)***	**0.626** ***(0.381)***	**11.14** ***(2.194)***	**194** ***(89.8)***	**58** ***(14.6)***	**75** ***(23.8)***	**28.837** ***(97.377)***

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temp. °F (°C) Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg (kPa)
Maximum Available Power—Two Hours 6th (H2) Gear											
21.78 *(16.24)*	1956 *(8.70)*	4.17 *(6.72)*	2799	6.61	1.953 *(7.393)*	0.626 *(0.381)*	11.15 *(2.196)*	203 *(94.7)*	56 *(13.3)*	69 *(20.6)*	28.910 *(97.625)*
75% of Pull at Maximum Power—Ten Hours 6th (H2) Gear											
18.27 *(13.62)*	1555 *(6.92)*	4.40 *(7.09)*	2898	4.85	1.641 *(6.213)*	0.627 *(0.381)*	11.13 *(2.192)*	192 *(88.7)*	53 *(11.8)*	67 *(19.4)*	28.812 *(97.297)*
50% of Pull at Maximum Power—Two Hours 6th (H2) Gear											
12.54 *(9.35)*	1034 *(4.60)*	4.55 *(7.32)*	2952	3.50	1.326 *(5.019)*	0.738 *(0.449)*	9.46 *(1.863)*	185 *(85.0)*	47 *(8.3)*	48 *(8.9)*	29.005 *(97.946)*
50% of Pull at Reduced Engine Speed—Two Hours 7th (H3) Gear											
12.60 *(9.40)*	1036 *(4.61)*	4.56 *(7.34)*	2060	3.40	1.111 *(4.205)*	0.615 *(0.374)*	11.35 *(2.235)*	185 *(85.0)*	46 *(7.5)*	48 *(8.9)*	29.030 *(98.030)*
MAXIMUM POWER IN SELECTED GEARS											
13.92 *(10.38)*	3918 *(17.43)*	1.33 *(2.14)*	2945	14.89	3rd (L3) Gear			187 *(85.8)*	44 *(6.7)*	46 *(7.8)*	28.950 *(97.760)*
22.10 *(16.48)*	3401 *(15.13)*	2.44 *(3.92)*	2801	12.25	4th (L4) Gear			194 *(89.7)*	48 *(8.9)*	54 *(12.2)*	28.950 *(97.760)*
22.90 *(17.08)*	2750 *(12.23)*	3.12 *(5.03)*	2801	9.26	5th (H1) Gear			193 *(89.2)*	52 *(11.1)*	62 *(16.7)*	28.940 *(97.726)*
22.96 *(17.12)*	2068 *(9.20)*	4.16 *(6.70)*	2800	6.95	6th (H2) Gear			192 *(88.6)*	50 *(10.0)*	58 *(14.4)*	28.960 *(97.794)*
22.47 *(16.75)*	1372 *(6.10)*	6.14 *(9.88)*	2801	4.37	7th (H3) Gear			193 *(89.4)*	54 *(12.2)*	65 *(18.3)*	28.930 *(97.692)*

LUGGING ABILITY IN 6th (H2) GEAR

Crankshaft Speed rpm	2800	2519	2231	1943	1662	1396	1105
Pull—lbs *(kN)*	2068 *(9.20)*	2216 *(9.86)*	2302 *(10.24)*	2343 *(10.42)*	2395 *(10.65)*	2419 *(10.76)*	2283 *(10.15)*
Increase in Pull %	0	7	11	13	16	17	10
Power—Hp *(kW)*	22.96 *(17.12)*	22.01 *(16.41)*	20.18 *(15.05)*	17.88 *(13.33)*	15.59 *(11.63)*	13.21 *(9.85)*	9.95 *(7.42)*
Speed—Mph *(km/h)*	4.16 *(6.70)*	3.73 *(6.00)*	3.29 *(5.29)*	2.86 *(4.60)*	2.44 *(3.93)*	2.05 *(3.30)*	1.63 *(2.63)*
Slip %	6.95	7.35	7.64	7.74	8.12	8.22	7.64

Department of Agricultural Engineering

Dates of Test: October 7-24, 1980

Manufacturer: KUBOTA, LTD., 2-47 Shikitsu-Higashi 1-chome Naniwa-ku, Osaka Japan

FUEL, OIL AND TIME: **Fuel** No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** ***(15°/15°)*** 0.8378 **Fuel weight** 6.976 lbs/gal *(0.836 kg/l)* **Oil SAE** 20-20W **API service classification** SB/SE-CA/CD **To motor** 1.500 gal *(5.679 l)* **Drained from motor** 1.382 gal *(5.230 l)* **Transmission and final drive lubricant** SAE 80 or tractor hydraulic fluid **Front axle lubricant** SAE 90 **Total time engine was operated** 41.5 hours

ENGINE: **Make** Kubota Diesel **Type** three cylinder vertical **Serial No.** D1301-DA-01341 **Crankshaft** lengthwise **Rated rpm** 2800 **Bore and stroke** 3.23" × 3.23" *(82 mm × 82 mm)* **Compression ratio** 21 to 1 **Displacement** 79.3 cu in *(1299 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** one paper element **Oil filter** one full flow paper cartridge **Fuel filter** one paper cartridge **Muffler** vertical **Cooling medium temperature control** one thermostat

CHASSIS: **Type** front wheel assist **Serial No.** L305DT-10249 **Tread width** rear 50.2" *(1275 mm)* to 66.1" *(1680 mm)* front 48.2" *(1225 mm)* **Wheel base** 72.8" *(1850 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 31.4" *(798 mm)* Vertical distance above roadway 32.7" *(830 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph** ***(km/h)*** first 0.8 *(1.3)* second 1.1 *(1.8)* third 1.6 *(2.5)* fourth 2.9 *(4.7)* fifth 3.6 *(5.8)* sixth 4.7 *(7.6)* seventh 6.8 *(10.9)* eighth 12.7 *(20.4)* reverse 1.4 *(2.3)*, 6.2 *(9.9)* **Clutch** dual plate dry disc operated by foot pedal. **Brakes** wet disc operated by two foot pedals which can be locked together **Steering** power assist **Turning radius** (on concrete surface with brake applied) right 110" *(2.8 m)* left 110" *(2.8 m)* (on concrete surface without brake) right 150" *(3.8 m)* left 150" *(3.8 m)* **Turning space diameter** (on concrete surface with brake applied) right 228" *(5.8 m)* left 228" *(5.8 m)* (on concrete surface without brake) right 307" *(7.8 m)* left 307" *(7.8 m)* **Power take-off** 540 rpm at 2534 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 135°F *(57.3°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	94.0	93.5
75% of Pull at Maximum Power—Ten Hours		91.5
50% of Pull at Maximum Power—Two Hours		91.5
50% of Pull at Reduced Engine Speed—Two Hours		89.5
Bystander in 8th (H4) gear		81.5

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	Fuel Consumption lb/hp.hr *(kg/kW.h)*	Fuel Consumption Hp.hr/gal *(kW.h/l)*	Temp. °F (°C) Cool-ing med	Temp. °F (°C) Air wet bulb	Temp. °F (°C) Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 6th (H2) Gear											
21.43 *(15.98)*	1859 *(8.27)*	4.32 *(6.96)*	2800	5.47	1.953 *(7.393)*	0.636 *(0.387)*	10.97 *(2.162)*	202 *(94.2)*	56 *(13.3)*	70 *(20.8)*	28.875 *(97.507)*
MAXIMUM POWER IN SELECTED GEARS											
15.85 *(11.82)*	4397 *(19.56)*	1.35 *(2.18)*	2924	14.85		3rd (L3) Gear		189 *(86.9)*	46 *(7.8)*	51 *(10.6)*	28.960 *(97.794)*
22.47 *(16.76)*	2597 *(11.55)*	3.25 *(5.22)*	2800	7.67		5th (H1) Gear		195 *(90.3)*	53 *(11.7)*	64 *(17.8)*	28.930 *(97.692)*
22.26 *(16.60)*	1938 *(8.62)*	4.31 *(6.93)*	2801	5.80		6th (H2) Gear		196 *(90.8)*	51 *(10.6)*	60 *(15.6)*	28.950 *(97.760)*

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 13.6-24; 4; 14 *(95)*	Two 13.6-24; 4; 14 *(95)*
Ballast	—Liquid (each)	400 lb *(181 kg)*	None
	—Cast Iron (each)	500 lb *(227 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 8.3-16; 4; 22 *(150)*	Two 8.3-16; 4; 22 *(150)*
Ballast	—Liquid (each)	85 lb *(39 kg)*	None
	—Cast Iron (each)	50 lb *(23 kg)*	None
Height of Drawbar		14 in *(355 mm)*	14 in *(355 mm)*
Static Weight with Operator	—Rear	3700 lb *(1678 kg)*	1900 lb *(862 kg)*
	—Front	1660 lb *(753 kg)*	1390 lb *(630 kg)*
	—Total	5360 lb *(2431 kg)*	3290 lb *(1492 kg)*

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1371.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers

Kubota L305 DT Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1372 —KUBOTA L345 DT DIESEL
ALSO KUBOTA L345 DIESEL
8 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temperature °F (°C) Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg (kPa)
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—597 rpm)								
29.35 (21.89)	2800	2.296 (8.691)	0.546 (0.332)	12.78 (2.519)	202 (94.3)	62 (16.8)	75 (23.8)	28.770 (97.152)
Standard Power Take-off Speed (540 rpm)—One Hour								
28.80 (21.48)	2532	2.256 (8.540)	0.547 (0.332)	12.76 (2.515)	206 (96.7)	63 (17.4)	75 (23.9)	28.745 (97.068)
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
25.46 (18.99)	2858	1.961 (7.423)	0.537 (0.327)	12.98 (2.558)	193 (89.4)	63 (17.2)	75 (23.6)	....
0.00 (0.00)	3023	0.710 (2.688)	....	....	185 (84.7)	64 (17.8)	76 (24.2)	....
13.13 (9.79)	2946	1.277 (4.834)	0.678 (0.413)	10.28 (2.025)	188 (86.7)	64 (17.5)	74 (23.1)	......
30.20 (22.52)	2801	2.447 (9.263)	0.565 (0.344)	12.34 (2.431)	200 (93.1)	64 (17.8)	75 (23.6)	....
6.66 (4.97)	2988	0.972 (3.679)	1.018 (0.619)	6.85 (1.351)	188 (86.7)	65 (18.1)	76 (24.2)	....
19.56 (14.59)	2926	1.613 (6.106)	0.575 (0.350)	12.13 (2.389)	190 (87.8)	65 (18.1)	75 (23.6)	....
Av 15.84 ***Av (11.81)***	**2924**	**1.497** ***(5.667)***	**0.659** ***(0.401)***	**10.58** ***(2.084)***	**191** ***(88.1)***	**64** ***(17.7)***	**75** ***(23.7)***	**28.713** ***(96.961)***

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temp. °F (°C) Cooling med	Air wet bulb	Air dry bulb	Barom. inch Hg (kPa)
Maximum Available Power—Two Hours 6th (H2) Gear											
25.27 (18.84)	2058 (9.15)	4.61 (7.41)	2802	6.66	2.365 (8.953)	0.653 (0.397)	10.68 (2.105)	194 (89.7)	56 (13.3)	73 (22.5)	28.945 (97.743)
75% of Pull at Maximum Power—Ten Hours 6th (H2) Gear											
20.92 (15.60)	1626 (7.23)	4.83 (7.77)	2889	5.18	1.935 (7.326)	0.645 (0.392)	10.81 (2.130)	186 (85.7)	41 (4.7)	47 (8.2)	28.929 (97.689)
50% of Pull at Maximum Power—Two Hours 6th (H2) Gear											
14.43 (10.76)	1089 (4.84)	4.97 (8.00)	2928	3.67	1.577 (5.969)	0.762 (0.464)	9.15 (1.802)	185 (84.7)	46 (7.5)	49 (9.4)	29.010 (97.962)
50% of Pull at Reduced Engine Speed—Two Hours 7th (H3) Gear											
14.37 (10.71)	1084 (4.82)	4.97 (8.00)	2038	3.52	1.218 (4.612)	0.592 (0.360)	11.79 (2.323)	186 (85.3)	54 (11.9)	62 (16.7)	29.005 (97.946)
MAXIMUM POWER IN SELECTED GEARS											
14.76 (11.01)	3795 (16.88)	1.46 (2.35)	2929	15.00		3rd (L3) Gear		187 (85.8)	47 (8.3)	56 (13.3)	28.650 (96.747)
25.39 (18.93)	3588 (15.96)	2.65 (4.27)	2800	13.25		4th (L4) Gear		191 (88.1)	48 (8.9)	59 (15.0)	28.650 (96.747)
26.00 (19.39)	2829 (12.58)	3.45 (5.55)	2800	9.25		5th (H1) Gear		191 (88.3)	48 (8.9)	59 (15.0)	28.650 (96.747)
26.72 (19.93)	2168 (9.65)	4.62 (7.44)	2799	6.25		6th (H2) Gear		190 (87.8)	42 (5.6)	49 (9.4)	28.640 (96.713)
25.39 (18.94)	1409 (6.27)	6.76 (10.88)	2799	4.51		7th (H3) Gear		190 (87.8)	48 (8.9)	59 (15.0)	28.650 (96.747)

LUGGING ABILITY IN 6th (H2) GEAR

Crankshaft Speed rpm	2799	2530	2233	1956	1678	1380
Pull—lbs (kN)	2168 (9.65)	2288 (10.18)	2343 (10.42)	2390 (10.63)	2462 (10.95)	2311 (10.28)
Increase in Pull %	0	6	8	10	14	7
Power—Hp (kW)	26.72 (19.93)	25.38 (18.92)	22.88 (17.07)	20.42 (15.23)	18.00 (13.42)	13.97 (10.42)
Speed—Mph (km/h)	4.62 (7.44)	4.16 (6.70)	3.66 (5.90)	3.20 (5.16)	2.74 (4.41)	2.27 (3.65)
Slip %	6.25	6.75	6.97	6.97	7.18	6.75

Department of Agricultural Engineering

Dates of Test: October 7-21, 1980

Manufacturer: KUBOTA, LTD., 2-47 Shikitsu-Higashi 1-chome Naniwa-ku, Osaka Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** ***(15°/15°)*** 0.8378 **Fuel weight** 6.976 lbs/gal *(0.836 kg/l)* **Oil SAE** 20-20W **API service classification** SB/SE-CA/CD **To motor** 2.029 gal *(7.682 l)* **Drained from motor** 1.828 gal *(6.918 l)* **Transmission and final drive lubricant** SAE 80 or tractor hydraulic fluid **Front axle lubricant** SAE 90 **Total time engine was operated** 43.5 hours

ENGINE: Make Kubota Diesel **Type** four cylinder vertical **Serial No.** V1501-DA-03568 **Crankshaft** lengthwise **Rated rpm** 2800 **Bore and stroke** 3.00" × 3.23" *(76 mm × 82 mm)* **Compression ratio** 21 to 1 **Displacement** 90.7 cu in *(1487 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** one paper element **Oil filter** one full flow paper cartridge **Fuel filter** one paper cartridge **Muffler** vertical **Cooling medium temperature control** one thermostat

CHASSIS: Type front wheel assist **Serial No.** L345DT-11371 **Tread width** rear 46.1" *(1170 mm)* to 66.1" *(1680 mm)* front 49.0" *(1245 mm)* **Wheel base** 76.6" *(1945 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 35.2" *(893 mm)* Vertical distance above roadway 34.6" *(880 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph** ***(km/h)*** first 0.9 *(1.5)* second 1.2 *(1.9)* third 1.7 *(2.7)* fourth 3.2 *(5.1)* fifth 3.9 *(6.3)* sixth 5.1 *(8.2)* seventh 7.4 *(11.8)* eighth 13.7 *(22.1)* reverse 1.6 *(2.6)*, 6.7 *(10.8)* **Clutch** dual plate dry disc operated by foot pedal **Brakes** wet disc operated by two foot pedals which can be locked together **Steering** power assist **Turning radius** (on concrete surface with brake applied) right 118" *(3.00 m)* left 118" *(3.00 m)* (on concrete surface without brake) right 150" *(3.80 m)* left 150" *(3.80 m)* **Turning space diameter** (on concrete surface with brake applied) right 244" *(6.20 m)* left 244" *(6.20 m)* (on concrete surface without brake) right 307" *(7.80 m)* left 307" *(7.80 m)* **Power take-off** 540 rpm at 2532 engine rpm.

REPAIRS and ADJUSTMENTS: During preliminary drawbar tests the front wheel drive linkage was found to be inoperative due to a mispositioned spring clip. After putting the clip in the correct position, the tests were continued.

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	92.5	93.0
75% of Pull at Maximum Power—Ten Hours		92.0
50% of Pull at Maximum Power—Two Hours		91.5
50% of Pull at Reduced Engine Speed—Two Hours		89.0
Bystander in 8th (H4) gear		82.5

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temp. °F (°C) Cooling med	Air wet bulb	Air dry bulb	Barom. inch Hg (kPa)
Maximum Available Power—Two Hours 6th (H2) Gear											
25.02 *(18.66)*	1976 *(8.79)*	4.75 *(7.64)*	2799	5.04	2.383 *(9.021)*	0.664 *(0.404)*	10.50 *(2.068)*	193 *(89.2)*	55 *(12.8)*	72 *(22.2)*	28.925 *(97.675)*
MAXIMUM POWER IN SELECTED GEARS											
17.77 *(13.25)*	4528 *(20.14)*	1.47 *(2.37)*	2910	14.83		3rd (L3) Gear		187 *(85.8)*	45 *(7.2)*	54 *(12.2)*	28.670 *(96.814)*
26.33 *(19.63)*	2078 *(9.24)*	4.75 *(7.65)*	2800	5.10		6th (H2) Gear		195 *(90.5)*	55 *(12.8)*	72 *(22.2)*	28.930 *(97.692)*

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 13.6-28; 6; 16 *(110)*	Two 13.6-28; 6; 16 *(110)*
Ballast	—Liquid (each)	350 lb *(159 kg)*	None
	—Cast Iron (each)	470 lb *(213 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 9.5-16; 6; 26 *(180)*	Two 9.5-16; 6; 26 *(180)*
Ballast	—Liquid (each)	100 lb *(45 kg)*	None
	—Cast Iron (each)	80 lb *(36 kg)*	None
Height of Drawbar		17 in *(430 mm)*	17 in *(430 mm)*
Static Weight with Operator	—Rear	3635 lb *(1649 kg)*	1995 lb *(905 kg)*
	—Front	1800 lb *(816 kg)*	1440 lb *(653 kg)*
	—Total	5435 lb *(2465 kg)*	3435 lb *(1558 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 134°F *(56.9°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1372**.

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers

Kubota L345 DT Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1373 — WHITE ISEKI 2-30 DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption			Temperature °F *(°C)*			Barometer inch Hg *(kPa)*
			gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—645 rpm)									
	28.33 *(21.13)*	2600	2.366 *(8.956)*	0.583 *(0.355)*	11.97 *(2.359)*	211 *(99.3)*	57 *(14.1)*	75 *(23.9)*	28.050 *(98.097)*
Standard Power Take-off Speed (540 rpm)—One Hour									
	24.50 *(18.27)*	2176	2.037 *(7.711)*	0.580 *(0.353)*	12.03 *(2.369)*	209 *(98.1)*	56 *(13.5)*	75 *(23.7)*	29.055 *(98.114)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	25.39 *(18.93)*	2744	1.972 *(7.465)*	0.542 *(0.330)*	12.87 *(2.536)*	197 *(91.7)*	55 *(12.8)*	74 *(23.3)*	....
	0.00 *(0.00)*	2892	0.752 *(2.847)*	....	....	180 *(81.9)*	56 *(13.1)*	75 *(23.9)*	....
	12.92 *(9.63)*	2792	1.293 *(4.895)*	0.699 *(0.425)*	9.99 *(1.967)*	182 *(83.3)*	56 *(13.3)*	74 *(23.3)*	....
	28.35 *(21.14)*	2600	2.372 *(8.979)*	0.584 *(0.355)*	11.95 *(2.354)*	209 *(98.1)*	56 *(13.3)*	76 *(24.4)*	....
	6.58 *(4.91)*	2839	1.023 *(3.872)*	1.086 *(0.660)*	6.43 *(1.268)*	180 *(82.2)*	56 *(13.3)*	75 *(23.9)*	....
	19.26 *(14.36)*	2774	1.594 *(6.034)*	0.578 *(0.352)*	12.08 *(2.380)*	185 *(85.0)*	56 *(13.3)*	76 *(24.4)*	....
Av ***Av***	**15.42** ***(11.50)***	**2774**	**1.501** ***(5.682)***	**0.680** ***(0.413)***	**10.27** ***(2.024)***	**189** ***(87.1)***	**56** ***(13.2)***	**75** ***(23.9)***	**29.070** ***(98.165)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F *(°C)*			Barom. inch Hg *(kPa)*
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 6th (H2) Gear											
24.88 *(18.56)*	1783 *(7.93)*	5.23 *(8.42)*	2598	7.45	2.310 *(8.742)*	0.648 *(0.394)*	10.77 *(2.123)*	189 *(86.9)*	40 *(4.4)*	50 *(9.7)*	29.025 *(98.013)*
75% of Pull at Maximum Power—Ten Hours 6th (H2) Gear											
21.09 *(15.73)*	1387 *(6.17)*	5.70 *(9.18)*	2765	5.25	1.848 *(6.994)*	0.612 *(0.372)*	11.42 *(2.249)*	180 *(81.9)*	31 *(0.4)*	34 *(1.3)*	29.305 *(98.959)*
50% of Pull at Maximum Power—Two Hours 6th (H2) Gear											
14.29 *(10.65)*	918 *(4.08)*	5.84 *(9.40)*	2789	3.85	1.486 *(5.625)*	0.726 *(0.442)*	9.61 *(1.894)*	178 *(81.1)*	37 *(2.8)*	45 *(6.9)*	29.105 *(98.283)*
50% of Pull at Reduced Engine Speed—Two Hours 7th (H3) Gear											
14.51 *(10.82)*	929 *(4.13)*	5.86 *(9.43)*	1809	3.70	1.235 *(4.676)*	0.594 *(0.361)*	11.75 *(2.315)*	177 *(80.6)*	41 *(5.0)*	45 *(7.2)*	29.090 *(98.233)*
MAXIMUM POWER IN SELECTED GEARS											
16.51 *(12.31)*	2816 *(12.53)*	2.20 *(3.54)*	2751	14.93	4th (L4) Gear			181 *(82.5)*	41 *(5.0)*	49 *(9.4)*	29.070 *(98.165)*
24.67 *(18.40)*	2573 *(11.45)*	3.60 *(5.79)*	2600	12.22	5th (H1) Gear			190 *(87.5)*	41 *(5.0)*	48 *(8.9)*	29.090 *(98.233)*
25.75 *(19.20)*	1847 *(8.22)*	5.23 *(8.42)*	2599	7.57	6th (H2) Gear			189 *(87.2)*	41 *(5.0)*	49 *(9.4)*	29.060 *(98.131)*
25.81 *(19.24)*	1159 *(5.15)*	8.35 *(13.44)*	2601	4.46	7th (H3) Gear			187 *(86.1)*	40 *(4.4)*	50 *(10.0)*	29.040 *(98.064)*

LUGGING ABILITY IN 6th (H2) GEAR

Crankshaft Speed rpm	2599	2346	2080	1818	1545	1294
Pull—lbs *(kN)*	1847 *(8.22)*	1876 *(8.34)*	1901 *(8.46)*	1902 *(8.46)*	1845 *(8.21)*	1809 *(8.05)*
Increase in Pull %	0	2	3	3	0	–2
Power—Hp *(kW)*	25.75 *(19.20)*	23.58 *(17.58)*	21.18 *(15.79)*	18.51 *(13.80)*	15.29 *(11.40)*	12.59 *(9.39)*
Speed—Mph *(km/h)*	5.23 *(8.42)*	4.71 *(7.59)*	4.18 *(6.72)*	3.65 *(5.87)*	3.11 *(5.00)*	2.61 *(4.20)*
Slip %	7.57	7.71	7.81	7.71	7.53	7.43

Department of Agricultural Engineering

Dates of Test: October 22 — 29, 1980

MANUFACTURER: ISEKI AND CO., LTD., Tokyo, Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane** No. 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8385 **Fuel weight** 6.982 lbs/gal *(0.837 kg/l)* **Oil** White Farm Equipment Turbo-Diesel Oil **SAE** 30 **API service classification** CB/CD (DS) **To motor** 2.797 gal *(10.589 l)* **Drained from motor** 2.531 gal *(9.580 l)* **Transmission lubricant** SAE 80-90 **Hydraulic lubricant** White Farm Equipment type 55 hydraulic oil **Total time engine was operated** 41.5 hours

ENGINE: Make Isuzu Diesel **Type** three cylinder vertical **Serial No.** 3AD11-498L-532789 **Crankshaft** lengthwise **Rated rpm** 2600 **Bore and stroke** 3.386" x 3.386" *(86 mm x 86 mm)* **Compression ratio** 20 to 1 **Displacement** 91.4 cu in *(1498 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** one paper element **Oil filter** one full flow paper cartridge **Fuel Filter** one metal screen with sediment bowl and one paper cartridge **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type standard **Serial No.** 100870 J **Tread width** rear 47.2" *(1200 mm)* to 59.8" *(1520 mm)* front 43.3" *(1100 mm)* to 59.1" *(1500 mm)* **Wheel base** 68.9" *(1750 mm)* **Center of Gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 26.6" *(676 mm)* Vertical distance above roadway 26.6" *(675 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 0.8 *(1.3)* second 1.1 *(1.8)* third 1.7 *(2.7)* fourth 2.4 *(3.9)* fifth 4.0 *(6.5)* sixth 5.6 *(9.0)* seventh 8.6 *(13.9)* eighth 12.2 *(19.7)* reverse 1.1 *(1.8)*, 5.6 *(9.0)* **Clutch** dry single disc operated by foot pedal **Brakes** drum and shoe operated by two foot pedals which can be locked together **Steering** mechanical **Turning radius** (on concrete surface with brake applied) right 105" *(2.57 mm)* left 103" *(2.62 m)* (on concrete surface without brake) right 116" *(2.95 m)* left 114" *(2.90 m)* **Turning space diameter** (on concrete surface with brake applied) right 222" *(5.64 m)* left 218" *(5.54 m)* (on concrete surface without brake) right 244" *(6.20 m)* left 240" *(6.10)* **Power take-off** 540 rpm at 2176 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	96.5
75% of Pull at Maximum Power—Ten Hours	94.5
50% of Pull at Maximum Power—Two Hours	93.5
50% of Pull at Reduced Engine Speed—Two Hours	89.0
Bystander in 8th (H4) gear	83.0

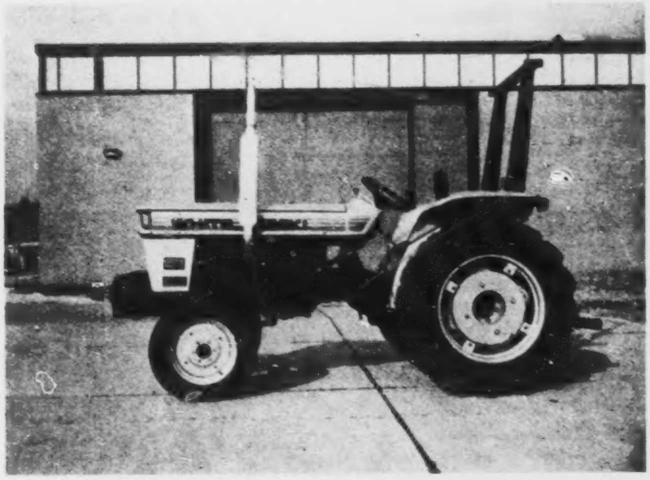
TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 12.4-24; 4; 14 *(95)*	Two 12.4-24; 4; 14 *(95)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	340 lb *(154 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 5.00-15; 4; 44 *(305)*	Two 5.00-15; 4; 44 *(305)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	84 lb *(38 kg)*	None
Height of Drawbar		12.5 in *(315 mm)*	12.5 in *(315 mm)*
Static Weight with Operator—Rear		2595 lb *(1177 kg)*	1915 lb *(869 kg)*
Front		1258 lb *(571 kg)*	1090 lb *(494 kg)*
Total		3853 lb *(1748 kg)*	3005 lb *(1363 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 146°F *(63.4° C)*. Four gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1373.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers



White Iseki 2-30 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1374 — WHITE ISEKI 2-35 DIESEL
8 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption			Temperature °F *(°C)*			
		gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—595 rpm)								
32.84 *(24.49)*	2400	2.604 *(9.857)*	0.554 *(0.337)*	12.61 *(2.485)*	214 *(101.3)*	55 *(12.6)*	75 *(23.8)*	29.050 *(98.096)*
Standard Power Take-off Speed (540 rpm)—One Hour								
30.94 *(23.07)*	2176	2.441 *(9.240)*	0.551 *(0.335)*	12.68 *(2.497)*	212 *(100.2)*	54 *(12.2)*	75 *(23.9)*	29.035 *(98.047)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
28.88 *(21.54)*	2480	2.153 *(8.150)*	0.521 *(0.317)*	13.41 *(2.643)*	201 *(93.6)*	54 *(12.2)*	75 *(23.9)*	....
0.00 *(0.00)*	2616	0.791 *(2.994)*	....	....	177 *(80.6)*	54 *(12.2)*	75 *(23.9)*	....
14.73 *(10.98)*	2531	1.388 *(5.254)*	0.658 *(0.400)*	10.61 *(2.090)*	183 *(83.9)*	54 *(12.2)*	75 *(23.9)*	....
32.85 *(24.50)*	2401	2.617 *(9.906)*	0.556 *(0.338)*	12.56 *(2.473)*	211 *(99.2)*	54 *(12.2)*	75 *(23.9)*	....
7.46 *(5.56)*	2567	1.066 *(4.035)*	0.997 *(0.607)*	7.00 *(1.378)*	180 *(82.2)*	54 *(12.2)*	76 *(24.2)*	....
21.89 *(16.32)*	2509	1.732 *(6.556)*	0.552 *(0.336)*	12.64 *(2.489)*	186 *(85.3)*	54 *(12.2)*	76 *(24.2)*	....
Av 17.64 ***Av (13.15)***	**2517**	**1.624** ***(6.148)***	**0.643** ***(0.391)***	**10.86** ***(2.139)***	**189** ***(87.4)***	**54** ***(12.2)***	**75** ***(24.0)***	**29.023** ***(98.007)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F *(°C)*			
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 6th (H2) Gear											
28.55 *(21.29)*	2152 *(9.57)*	4.98 *(8.01)*	2400	8.63	2.542 *(9.623)*	0.622 *(0.378)*	11.23 *(2.213)*	184 *(84.4)*	44 *(6.4)*	51 *(10.3)*	29.140 *(98.401)*
75% of Pull at Maximum Power—Ten Hours 6th (H2) Gear											
24.19 *(18.04)*	1705 *(7.58)*	5.32 *(8.56)*	2497	6.23	2.062 *(7.807)*	0.595 *(0.362)*	11.73 *(2.310)*	181 *(82.7)*	47 *(8.1)*	54 *(12.1)*	29.100 *(98.266)*
50% of Pull at Maximum Power—Two Hours 6th (H2) Gear											
16.68 *(12.44)*	1133 *(5.04)*	5.52 *(8.89)*	2532	4.02	1.611 *(6.099)*	0.674 *(0.410)*	10.35 *(2.039)*	177 *(80.6)*	42 *(5.3)*	45 *(7.2)*	29.085 *(98.216)*
50% of Pull at Reduced Engine Speed—Two Hours 7th (H3) Gear											
16.70 *(12.45)*	1133 *(5.04)*	5.53 *(8.90)*	1640	3.86	1.253 *(4.744)*	0.524 *(0.319)*	13.33 *(2.625)*	179 *(81.4)*	51 *(10.3)*	58 *(14.2)*	29.040 *(98.064)*
MAXIMUM POWER IN SELECTED GEARS											
27.39 *(20.42)*	2978 *(13.25)*	3.45 *(5.55)*	2460	14.72	5th (H1) Gear			183 *(83.6)*	39 *(3.9)*	45 *(7.2)*	29.180 *(98.536)*
30.06 *(22.41)*	2268 *(10.09)*	4.97 *(8.00)*	2399	8.77	6th (H2) Gear			184 *(84.2)*	40 *(4.4)*	46 *(7.8)*	29.180 *(98.536)*
30.37 *(22.64)*	1424 *(6.33)*	8.00 *(12.87)*	2401	5.09	7th (H3) Gear			183 *(83.9)*	42 *(5.6)*	48 *(8.9)*	29.150 *(98.435)*

LUGGING ABILITY IN 6th (H2) GEAR

Crankshaft Speed rpm	2399	2156	1907	1674	1436	1188
Pull—lbs *(kN)*	1268 *(10.09)*	2376 *(10.57)*	2408 *(10.71)*	2417 *(10.75)*	2407 *(10.71)*	2347 *(10.44)*
Increase in Pull %	0	5	6	7	6	3
Power—Hp *(kW)*	30.06 *(22.41)*	28.12 *(20.97)*	25.18 *(18.78)*	22.16 *(16.53)*	18.92 *(14.11)*	15.33 *(11.43)*
Speed—Mph *(km/h)*	4.97 *(8.00)*	4.44 *(7.14)*	3.92 *(6.31)*	3.44 *(5.53)*	2.95 *(4.74)*	2.45 *(3.94)*
Slip %	8.77	9.34	9.53	9.53	9.62	9.15

Department of Agricultural Engineering

Dates of Test: October 22 — November 3,1980

MANUFACTURER: ISEKI AND CO., LTD., Tokyo, Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane** No. 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8385 **Fuel weight** 6.982 lbs/gal *(0.837 kg/l)* **Oil** White Farm Equipment Turbo-Diesel Oil **SAE** 30 **API service classification** CB/CD (DS) **To motor** 2.719 gal *(10.293 l)* **Drained from motor** 2.568 gal *(9.719 l)* **Transmission lubricant** SAE 80-90 **Hydraulic lubricant** White Farm Equipment type 55 hydraulic oil **Total time engine was operated** 32.0 hours

ENGINE: Make Isuzu Diesel **Type** three cylinder vertical **Serial No.** 531954 **Crankshaft** lengthwise **Rated rpm** 2400 **Bore and stroke** 3.386" x 4.02" *(86 mm x 102 mm)* **Compression ratio** 20 to 1 **Displacement** 108.4 cu in *(1777 ml)* **Cranking system** 12 volt **Lubrication** pressure **Air cleaner** one paper element **Oil filter** one full flow paper cartridge **Fuel Filter** one metal screen with sediment bowl and one paper cartridge **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type standard **Serial No.** 004408 J **Tread width** rear 46.8" *(1190 mm)* to 60.6" *(1540 mm)* front 43.3" *(1100 mm)* to 59.1" *(1500 mm)* **Wheel base** 68.9" *(1750 mm)* **Center of Gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 26.5" *(673 mm)* Vertical distance above roadway 27.9" *(709 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 0.7 *(1.2)* second 1.0 *(1.6)* third 1.6 *(2.5)* fourth 2.2 *(3.6)* fifth 3.9 *(6.2)* sixth 5.3 *(8.5)* seventh 8.2 *(13.2)* eighth 11.6 *(18.7)* reverse 1.0 *(1.6)*, 5.3 *(8.5)* **Clutch** dry single disc operated by foot pedal **Brakes** drum and shoe operated by two foot pedals which can be locked together **Steering** power assist **Turning radius** (on concrete surface with brake applied) right 108" *(2.75 mm)* left 105" *(2.67 m)* (on concrete surface without brake) right 120" *(3.05 m)* left 118" *(3.00 m)* **Turning space diameter** (on concrete surface with brake applied) right 230" *(5.84 m)* left 224" *(5.69 m)* (on concrete surface without brake) right 254" *(6.45 m)* left 250" *(6.35)* **Power take-off** 540 rpm at 2176 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	96.5
75% of Pull at Maximum Power—Ten Hours	94.0
50% of Pull at Maximum Power—Two Hours	92.0
50% of Pull at Reduced Engine Speed—Two Hours	89.0
Bystander in 8th (H4) gear	82.5

TIRES, BALLAST AND WEIGHT		**With Ballast**	**Without Ballast**
Rear Tires	—No., size, ply & psi *(kPa)*	Two 13.6-24; 4; 14 *(95)*	Two 13.6-24; 4; 14 *(95)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	330 lb *(150 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 5.50-16; 6; 40 *(275)*	Two 5.50-16; 6; 40 *(275)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	70 lb *(32 kg)*	None
Height of Drawbar		13.5 in *(345 mm)*	13.5 in *(345 mm)*
Static Weight with Operator	—Rear	2680 lb *(1216 kg)*	2020 lb *(916 kg)*
	Front	1290 lb *(585 kg)*	1150 lb *(522 kg)*
	Total	3970 lb *(1801 kg)*	3170 lb *(1438 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 145°F *(62.8° C)*. Three gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1374.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers

White Iseki 2-35 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1375 — WHITE 4-175 FIELD BOSS DIESEL
18 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—1023 rpm)								
151.69	2600	9.920	0.457	15.29	177	54	75	29.297
(113.12)		*(37.551)*	*(0.278)*	*(3.012)*	*(80.7)*	*(12.3)*	*(23.9)*	*(98.930)*
Standard Power Take-off Speed (1000 rpm) — One Hour								
151.29	2542	9.759	0.450	15.50	177	54	75	29.293
(112.82)		*(36.942)*	*(0.274)*	*(3.054)*	*(80.8)*	*(12.2)*	*(23.9)*	*(98.916)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
133.45	2694	9.075	0.475	14.71	177	55	77	......
(99.51)		*(34.353)*	*(0.289)*	*(2.897)*	*(80.3)*	*(12.5)*	*(24.7)*	......
0.00	2857	3.841	.....	.....	174	54	75	......
(0.00)		*(14.540)*	.....	.....	*(78.6)*	*(11.9)*	*(23.6)*	......
69.15	2786	6.325	0.639	10.93	175	54	76	......
(51.57)		*(23.943)*	*(0.388)*	*(2.154)*	*(79.4)*	*(11.9)*	*(24.2)*	......
151.99	2601	9.900	0.455	15.35	178	54	76	......
(113.34)		*(37.476)*	*(0.277)*	*(3.024)*	*(81.1)*	*(12.2)*	*(24.2)*	......
34.90	2823	5.169	1.034	6.75	174	54	75	......
(26.02)		*(19.567)*	*(0.629)*	*(1.330)*	*(78.9)*	*(12.2)*	*(23.9)*	......
102.09	2746	7.691	0.526	13.27	175	54	75	......
(76.13)		*(29.114)*	*(0.320)*	*(2.615)*	*(79.4)*	*(12.2)*	*(23.9)*	......
Av 81.93	**2751**	**7.000**	**0.597**	**11.70**	**175**	**54**	**75**	**29.297**
Av *(61.10)*		*(26.498)*	*(0.363)*	*(2.306)*	*(79.6)*	*(12.2)*	*(24.1)*	*(98.930)*

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 8th (3D) Gear											
127.15	10107	4.72	2600	3.25	9.811	0.539	12.96	174	52	64	28.925
(94.82)	*(44.96)*	*(7.59)*			*(37.138)*	*(0.328)*	*(2.553)*	*(78.9)*	*(10.8)*	*(17.8)*	*(97.675)*
75% of Pull at Maximum Power—Ten Hours 8th (3D) Gear											
103.70	7789	4.99	2727	2.33	8.654	0.583	11.98	173	46	57	29.108
(77.33)	*(34.65)*	*(8.03)*			*(32.760)*	*(0.354)*	*(2.361)*	*(78.5)*	*(7.9)*	*(14.1)*	*(98.293)*
50% of Pull at Maximum Power—Two Hours 8th (3D) Gear											
71.67	5246	5.12	2780	1.69	7.161	0.698	10.01	172	44	50	29.070
(53.45)	*(23.33)*	*(8.25)*			*(27.108)*	*(0.424)*	*(1.972)*	*(77.8)*	*(6.4)*	*(10.0)*	*(98.165)*
50% of Pull at Reduced Engine Speed—Two Hours 14th (5D) Gear											
70.88	5198	5.11	1465	1.65	4.816	0.474	14.72	172	49	62	29.030
(52.85)	*(23.12)*	*(8.23)*			*(18.230)*	*(0.289)*	*(2.899)*	*(77.5)*	*(9.4)*	*(16.4)*	*(98.030)*
MAXIMUM POWER IN SELECTED GEARS											
109.98	19905	2.07	2688	14.68	3rd (1O) Gear			171	36	37	29.050
(82.02)	*(88.54)*	*(3.33)*						*(76.9)*	*(2.2)*	*(2.8)*	*(98.097)*
125.60	16319	2.89	2599	6.34	4rd (2U) Gear			175	51	62	28.910
(93.66)	*(72.59)*	*(4.65)*						*(79.2)*	*(10.6)*	*(16.7)*	*(97.625)*
130.41	13761	3.55	2600	4.61	5th (2D) Gear			175	50	60	28.910
(97.25)	*(61.21)*	*(5.72)*						*(79.2)*	*(10.0)*	*(15.6)*	*(97.625)*
129.13	12535	3.86	2599	4.15	6th (3U) Gear			175	50	60	28.910
(96.29)	*(55.76)*	*(6.22)*						*(79.2)*	*(10.0)*	*(15.6)*	*(97.625)*
129.16	11292	4.29	2599	3.60	7th (2O) Gear			175	50	60	28.910
(96.31)	*(50.23)*	*(6.90)*						*(79.2)*	*(10.0)*	*(15.6)*	*(97.625)*
130.59	10385	4.72	2598	3.21	8th (3D) Gear			174	48	58	28.910
(97.38)	*(46.19)*	*(7.59)*						*(78.9)*	*(8.9)*	*(14.4)*	*(97.625)*
131.93	9412	5.26	2600	2.82	9th (4U) Gear			175	51	62	28.910
(98.38)	*(41.86)*	*(8.46)*						*(79.2)*	*(10.6)*	*(16.7)*	*(97.625)*
127.69	8445	5.67	2599	2.50	10th (3O) Gear			175	51	62	28.920
(95.22)	*(37.56)*	*(9.13)*						*(79.2)*	*(10.6)*	*(16.7)*	*(97.625)*
133.72	7843	6.39	2598	2.42	11th (4D) Gear			175	51	63	28.910
(99.72)	*(34.89)*	*(10.29)*						*(79.4)*	*(10.6)*	*(17.2)*	*(97.625)*
129.88	6511	7.48	2599	2.01	12th (5U) Gear			175	51	63	28.910
(96.85)	*(28.96)*	*(12.04)*						*(79.4)*	*(10.6)*	*(17.2)*	*(97.625)*
130.41	6375	7.67	2600	1.85	13th (4O) Gear			174	51	63	28.910
(97.25)	*(28.36)*	*(12.35)*						*(79.2)*	*(10.6)*	*(17.2)*	*(97.625)*
128.80	5317	9.08	2600	1.53	14th (5D) Gear			175	51	63	28.910
(96.05)	*(23.65)*	*(14.62)*						*(79.2)*	*(10.6)*	*(17.2)*	*(97.625)*

Department of Agricultural Engineering

Dates of Test: October 24 — November 6,1980

MANUFACTURER: WHITE FARM EQUIPMENT COMPANY, 2625 Butterfield Road, Oak Brook, Illinois 60521

FUEL, OIL AND TIME: **Fuel** No. 2 Diesel **Cetane** No. 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8385 **Fuel weight** 6.982 lbs/gal *(0.837 kg/l)* **Oil SAE** 30 **API service classification** CB/CD (DS) **To motor** 2.707 gal *(10.248 l)* **Drained from motor** 1.790 gal *(6.776 l)* **Transmission and final drive lubricant** White Farm Equipment Universal tractor Hydraulic transmission Fluid **Hydraulic lubricant** White Farm Equipment Co. type 55 Hydraulic Oil **Total time engine was operated** 40.0 hours

ENGINE: **Make** Caterpillar Diesel **Type** Eight cylinder vee **Serial No.** 90N 43983 **Crankshaft** lengthwise **Rated rpm** 2600 **Bore and stroke** 4.5" x 5.0" *(114.3 mm x 127 mm)* **Compression ratio** 16.5 to 1 **Displacement** 636 cu in *(10424 ml)* **Cranking system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with aspirator **Oil filter** two full flow cartridges **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for transmission and hydraulic oil **Fuel Filter** one paper cartridge **Muffler** underhood **Exhaust** vertical **Cooling medium temperature control** two thermostats.

CHASSIS: **Type** Four wheel drive with duals **Serial No.** 292296-422 **Tread width** rear 60" *(1524 mm)* to 108" *(2743 mm)* front 60" *(1524 mm)* to 108" *(2743 mm)* **Wheel base** 118.4" *(3007 mm)* **Center of Gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 77.6" *(1971 mm)* Vertical distance above roadway 37.4" *(949 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with partial (3) range operator controlled power shift **Advertised speeds mph** *(km/h)* first 1.6 *(2.6)* second 1.9 *(3.0)* third 2.3 *(3.7)* fourth 3.0 *(4.8)* fifth 3.7 *(5.9)* sixth 3.9 *(6.2)* seventh 4.4 *(7.0)* eighth 4.8 *(7.7)* ninth 5.3 *(8.5)* tenth 5.7 *(9.2)* eleventh 6.4 *(10.3)* twelfth 7.5 *(12.1)* thirteenth 7.7 *(12.4)* fourteenth 9.0 *(14.5)* fifteenth 10.8 *(17.4)* sixteenth 13.1 *(21.1)* seventeenth 15.9 *(25.6)* eighteenth 19.0 *(30.6)* reverse 1.9 *(3.0)*, 2.3 *(3.7)*, 2.8 *(4.5)*, 4.8 *(7.7)*, 5.8 *(9.3)*, 6.9 *(11.1)* **Clutch** dry single plate operated by foot pedal **Brakes** dry triple disc hydraulically power actuated and operated by one foot pedal **Steering** hydrostatic and articulated **Turning radius** (on concrete surface without brake) right 218.3" *(5.54 mm)* left 216.8" *(5.51 m)* **Turning space diameter** (on concrete surface without brake) right 458.6" *(11.65 m)* left 455.6" *(11.57 m)* **Power take-off** 1000 rpm at 2542 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

LUGGING ABILITY IN 8th (3D) GEAR

Crankshaft Speed rpm	2598	2348	2075	1816	1553	1297	1031	795
Pull—lbs	10385	11166	11881	12757	13595	13961	14028	13057
(kN)	*(46.19)*	*(49.67)*	*(52.85)*	*(56.75)*	*(60.47)*	*(62.10)*	*(62.40)*	*(58.08)*
Increase in Pull %	0	8	14	23	31	34	35	26
Power—Hp	130.59	126.49	118.58	111.02	100.73	86.26	68.79	49.53
(kW)	*(97.38)*	*(94.32)*	*(88.42)*	*(82.78)*	*(75.11)*	*(64.33)*	*(51.29)*	*(36.93)*
Speed—Mph	4.72	4.25	3.74	3.26	2.78	2.32	1.84	1.42
(km/h)	*(7.59)*	*(6.84)*	*(6.02)*	*(5.25)*	*(4.47)*	*(3.73)*	*(2.96)*	*(2.29)*
Slip %	3.21	3.68	3.84	4.15	4.46	4.76	4.76	4.46

TRACTOR SOUND LEVEL WITH CAB	dB(A)
Maximum Available Power—Two Hours	81.0
75% of Pull at Maximum Power—Ten Hours	81.0
50% of Pull at Maximum Power—Two Hours	80.5
50% of Pull at Reduced Engine Speed—Two Hours	77.5
Bystander in 18th (6O) gear	94.0

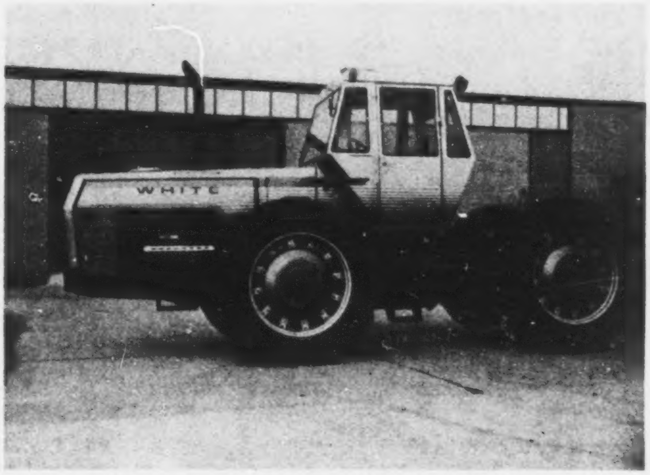
TIRES, BALLAST AND WEIGHT	Tested Without Ballast
Rear Tires—No., size, ply & psi *(kPa)*	Four 18.4-38; 8; 12 *(85)*
Ballast—Liquid (each)	None
—Cast Iron (each)	None
Front Tires—No., size, ply & psi *(kPa)*	Four 18.4-38; 8; 12 *(85)*
Ballast—Liquid (each)	None
—Cast Iron (each)	None
Height of Drawbar	20.5 in *(520 mm)*
Static Weight with Operator—Rear	7590 lb *(3443 kg)*
Front	12830 lb *(5820 kg)*
Total	20420 lb *(9263 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 156°F *(68.6°C)*. Twelve gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1375.**

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers



White 4-175 Field Boss Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1376 — INTERNATIONAL 884 ROWCROP DIESEL 16 SPEED

POWER TAKE-OFF PERFORMANCE

MAXIMUM POWER AND FUEL CONSUMPTION

Rated Engine Speed—Two Hours (PTO Speed—1096 rpm)

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
72.91 *(54.37)*	2400	4.737 *(17.931)*	0.454 *(0.276)*	15.39 *(3.032)*	195 *(90.7)*	60 *(15.4)*	75 *(24.1)*	28.647 *(96.735)*

Standard Power Take-off Speed (1000 rpm)—One Hour

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
69.76 *(52.02)*	2190	4.426 *(16.754)*	0.443 *(0.269)*	15.76 *(3.105)*	198 *(92.4)*	60 *(15.8)*	78 *(25.8)*	28.580 *(96.510)*

VARYING POWER AND FUEL CONSUMPTION—Two Hours

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
	64.11 *(47.81)*	2482	4.232 *(16.020)*	0.461 *(0.280)*	15.15 *(2.984)*	192 *(88.9)*	62 *(16.7)*	82 *(27.5)*	....
	0.00 *(0.00)*	2651	1.461 *(5.530)*	....	....	181 *(82.5)*	61 *(16.1)*	81 *(27.2)*	....
	33.27 *(24.81)*	2577	2.797 *(10.588)*	0.587 *(0.357)*	11.89 *(2.343)*	186 *(85.6)*	61 *(16.1)*	81 *(27.2)*	....
	72.12 *(53.78)*	2400	4.714 *(17.844)*	0.456 *(0.278)*	15.30 *(3.014)*	197 *(91.4)*	61 *(16.1)*	82 *(27.5)*	....
	16.87 *(12.58)*	2614	2.213 *(8.377)*	0.916 *(0.557)*	7.62 *(1.502)*	181 *(82.8)*	62 *(16.4)*	82 *(27.5)*	....
	48.93 *(36.49)*	2528	3.459 *(13.094)*	0.494 *(0.300)*	14.15 *(2.787)*	188 *(86.7)*	62 *(16.4)*	82 *(27.8)*	....
Av ***Av***	**39.22** ***(29.25)***	**2542**	**3.146** ***(11.909)***	**0.560** ***(0.341)***	**12.47** ***(2.456)***	**187** ***(86.3)***	**61** ***(16.3)***	**81** ***(27.4)***	**28.543** ***(96.387)***

DRAWBAR PERFORMANCE

Maximum Available Power—Two Hours 11th (2HiTA) Gear

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kw.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cooling med	Air wet bulb	Air dry bulb	Barom inch Hg *(kPa)*
63.97 *(47.70)*	4331 *(19.26)*	5.54 *(8.91)*	2400	5.28	4.744 *(17.959)*	0.518 *(0.315)*	13.48 *(2.656)*	187 *(85.8)*	43 *(5.8)*	51 *(10.6)*	29.100 *(98.266)*

75% of Pull at Maximum Power—Ten Hours 11th (2HiTA) Gear

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kw.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cooling med	Air wet bulb	Air dry bulb	Barom inch Hg *(kPa)*
50.77 *(37.86)*	3283 *(14.60)*	5.80 *(9.33)*	2478	3.96	3.932 *(14.882)*	0.541 *(0.329)*	12.91 *(2.544)*	186 *(85.6)*	54 *(12.1)*	68 *(19.9)*	28.446 *(96.058)*

50% of Pull at Maximum Power—Two Hours 11th (2HiTA) Gear

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kw.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cooling med	Air wet bulb	Air dry bulb	Barom inch Hg *(kPa)*
35.02 *(26.11)*	2192 *(9.75)*	5.99 *(9.64)*	2531	2.81	3.169 *(11.995)*	0.632 *(0.384)*	11.05 *(2.177)*	185 *(85.0)*	56 *(13.3)*	73 *(22.8)*	28.600 *(96.578)*

50% of Pull at Reduced Engine Speed—Two Hours 13th (3HiTA) Gear

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kw.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cooling med	Air wet bulb	Air dry bulb	Barom inch Hg *(kPa)*
35.07 *(26.15)*	2187 *(9.73)*	6.01 *(9.67)*	1560	2.71	2.489 *(9.420)*	0.496 *(0.301)*	14.09 *(2.776)*	186 *(85.6)*	55 *(12.5)*	75 *(23.6)*	28.600 *(96.578)*

MAXIMUM POWER IN SELECTED GEARS

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kw.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cooling med	Air wet bulb	Air dry bulb	Barom inch Hg *(kPa)*
55.53 *(41.41)*	8116 *(36.10)*	2.57 *(4.13)*	2460	12.34	5th (3LoTA) Gear			188 *(86.4)*	55 *(12.8)*	70 *(21.1)*	28.610 *(96.612)*
62.21 *(46.39)*	7554 *(33.60)*	3.09 *(4.97)*	2400	10.35	6th (3LoDD) Gear			186 *(85.6)*	43 *(6.1)*	52 *(11.1)*	29.110 *(98.300)*
63.09 *(47.05)*	6711 *(29.85)*	3.53 *(5.67)*	2400	8.63	7th (4LoTA) Gear			186 *(85.6)*	43 *(6.1)*	52 *(11.1)*	29.110 *(98.300)*
64.93 *(48.42)*	5830 *(25.93)*	4.18 *(6.72)*	2398	7.28	8th (1HiTA) Gear			187 *(86.1)*	42 *(5.6)*	51 *(10.6)*	29.120 *(98.334)*
63.94 *(47.68)*	5530 *(24.60)*	4.34 *(6.98)*	2400	6.91	9th (4LoDD) Gear			187 *(85.8)*	42 *(5.6)*	51 *(10.6)*	29.120 *(98.334)*
64.97 *(48.45)*	4759 *(21.17)*	5.12 *(8.24)*	2398	5.76	10th (1HiDD) Gear			187 *(85.8)*	41 *(5.0)*	50 *(10.0)*	29.130 *(98.368)*
65.39 *(48.76)*	4429 *(19.70)*	5.54 *(8.91)*	2401	5.38	11th (2HiTA) Gear			187 *(85.8)*	40 *(4.4)*	47 *(8.3)*	29.140 *(98.401)*
64.71 *(48.25)*	3593 *(15.98)*	6.75 *(10.87)*	2400	4.26	12th (2HiDD) Gear			187 *(85.8)*	43 *(6.1)*	52 *(11.1)*	29.100 *(98.266)*
63.39 *(47.27)*	2579 *(11.47)*	9.22 *(14.83)*	2399	2.98	13th (3HiTA) Gear			187 *(85.8)*	43 *(6.1)*	52 *(11.1)*	29.100 *(98.266)*

Department of Agricultural Engineering

Dates of Test: November 5-13, 1980

MANUFACTURER: INTERNATIONAL HARVESTER COMPANY, 401 North Michigan Avenue, Chicago, IL 60611.

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** ***(15°/15°)*** 0.8385 **Fuel weight** 6.982 lbs/gal *(0.837 kg/l)* **Oil SAE** 30 **API service classification** CA/CD-SC/SE **To motor** 1.972 gal *(7.465 l)* **Drained from motor** 1.874 gal *(7.095 l)* **Transmission and final drive lubricant** I.H. Hytran Fluid **Total time engine was operated** 44.0 hours

ENGINE Make International Diesel **Type** four cylinder vertical **Serial No.** 268DT2D051557* **Crankshaft** lengthwise **Rated rpm** 2400 **Bore and stroke** 3.937" × 5.51" *(100 mm × 139.9 mm)* **Compression ratio** 16 to 1 **Displacement** 268 cu in *(4392 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements **Oil filter** one full flow paper cartridge **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil **Fuel filter** two paper elements **Muffler** vertical **Cooling medium temperature control** one thermostat

CHASSIS: Type standard **Serial No.** B650011B005349-* **Tread width** rear 52" *(1321 mm)* to 100" *(2540 mm)* front 52" *(1321 mm)* to 80" *(2032 mm)* **Wheel base** 84" *(2134 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 27.2" *(690 mm)* Vertical distance above roadway 31.6" *(803 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with partial (2) range operator controlled powershift **Advertised speeds mph** ***(km/h)*** first 1.4 *(2.2)* second 1.7 *(2.7)* third 1.8 *(2.9)* fourth 2.2 *(3.5)* fifth 2.9 *(4.7)* sixth 3.6 *(5.7)* seventh 4.0 *(6.4)* eighth 4.6 *(7.5)* ninth 4.8 *(7.7)* tenth 5.6 *(9.0)* eleventh 6.0 *(9.7)* twelfth 7.3 *(11.7)* thirteenth 9.8 *(15.7)* fourteenth 11.8 *(19.0)* fifteenth 13.2 *(21.3)* sixteenth 15.9 *(25.6)* reverse 2.1 *(3.4)*, 2.5 *(4.1)*, 2.7 *(4.4)*, 3.3 *(5.3)*, 4.4 *(7.1)*, 5.3 *(8.6)*, 6.0 *(9.6)*, 7.2 *(11.6)* **Clutch** single plate dry disc operated by foot pedal **Brakes** single wet disc hydraulically actuated and operated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 122" *(3.10 m)* left 122" *(3.10 m)* (on concrete surface without brake) right 138.4" *(3.52m)* left 138.4" *(3.52 m)* **Turning space diameter** (on concrete surface with brake applied) right 254.5" *(6.46 m)* left 254.5" *(6.46 m)* (on concrete surface without brake) right 282" *(7.16 m)* left 282" *(7.16 m)* **Power take-off** 1000 rpm at 2190 engine rpm and 540 rpm at 2142 engine rpm.

LUGGING ABILITY IN 11th (2HiTA) GEAR

Crankshaft Speed rpm	2401	2161	1919	1683	1441	1202
Pull—lbs	4429	4811	5036	5211	5248	5017
(kN)	*(19.70)*	*(21.40)*	*(22.40)*	*(23.18)*	*(23.34)*	*(22.32)*
Increase in Pull %	0	9	14	18	18	13
Power—Hp	65.39	63.64	58.93	53.36	45.92	36.73
(kW)	*(48.76)*	*(47.46)*	*(43.94)*	*(39.79)*	*(34.24)*	*(27.39)*
Speed—Mph	5.54	4.96	4.39	3.84	3.28	2.75
(km/h)	*(8.91)*	*(7.98)*	*(7.06)*	*(6.18)*	*(5.28)*	*(4.42)*
Slip %	5.38	5.89	6.15	6.28	6.53	6.15

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	98.0
75% of Pull at Maximum Power—Ten Hours	99.0
50% of Pull at Maximum Power—Two Hours	98.5
50% of Pull at Reduced Engine Speed—Two Hours	94.5
Bystander in 16th (4HiDD) gear	88.5

TIRES, BALLAST AND WEIGHT		**With Ballast**	**Without Ballast**
Rear Tires	—No., size, ply & psi *(kPa)*	Two 18.4-30; 6; 16 *(110)*	Two 18.4-30; 6; 16 *(110)*
Ballast	—Liquid (each)	1096 lb *(497 kg)*	None
	—Cast Iron (each)	857 lb *(389 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 9.5L-16; 6; 36 *(250)*	Two 9.5L-16; 6; 36 *(250)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	20 lb *(9 kg)*	None
Height of Drawbar		16.5 in *(420 mm)*	16.5 in *(420 mm)*
Static Weight with Operator	—Rear	8130 lb *(3688 kg)*	4225 lb *(1916 kg)*
	Front	2020 lb *(916 kg)*	1980 lb *(898 kg)*
	Total	10150 lb *(4604 kg)*	6205 lb *(2814 kg)*

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump return was 145°F *(62.9°C)*. Nine gears were chosen between tire tangential pull limit and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1376**.

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers

International 884 Rowcrop Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1377 — INTERNATIONAL 3788 DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption			Temperature °F *(°C)*			Barometer inch Hg *(kPa)*
			gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—1207 rpm)									
	170.57 *(127.19)*	2500	10.928 *(41.367)*	0.447 *(0.272)*	15.61 *(3.075)*	191 *(88.4)*	55 *(12.7)*	75 *(23.9)*	29.157 *(98.458)*
Standard Power Take-off Speed (1000 rpm)—One Hour									
	166.39 *(124.08)*	2071	9.718 *(36.787)*	0.408 *(0.248)*	17.12 *(3.373)*	193 *(89.4)*	55 *(12.8)*	75 *(23.9)*	29.125 *(98.351)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	149.46 *(111.45)*	2575	10.037 *(37.994)*	0.469 *(0.285)*	14.89 *(2.933)*	189 *(87.2)*	55 *(12.8)*	75 *(23.9)*	…… ……
	0.00 *(0.00)*	2752	3.667 *(13.881)*	....	....	182 *(83.3)*	55 *(12.8)*	75 *(23.9)*	…… ……
	77.37 *(57.69)*	2672	6.788 *(25.695)*	0.612 *(0.372)*	11.40 *(2.245)*	184 *(84.4)*	56 *(13.1)*	76 *(24.2)*	…… ……
	170.70 *(127.29)*	2500	10.961 *(41.492)*	0.448 *(0.273)*	15.57 *(3.068)*	192 *(88.9)*	55 *(12.8)*	75 *(23.6)*	…… ……
	39.39 *(29.37)*	2720	5.244 *(19.851)*	0.929 *(0.565)*	7.51 *(1.480)*	183 *(83.6)*	55 *(12.8)*	75 *(23.9)*	…… ……
	114.17 *(85.14)*	2628	8.391 *(31.763)*	0.513 *(0.312)*	13.61 *(2.680)*	187 *(85.8)*	55 *(12.5)*	75 *(23.6)*	…… ……
Av ***Av***	**91.85** ***(68.49)***	**2641**	**7.515** ***(28.447)***	**0.571** ***(0.347)***	**12.22** ***(2.408)***	**186** ***(85.6)***	**55** ***(12.8)***	**75** ***(23.8)***	**29.097** ***(98.255)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F *(°C)*			Barom. inch Hg *(kPa)*
					gal/hr *(l/h)*	lb/hp.hr *(kg/kjw.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 6th (3LoDD) Gear											
142.05 *(105.93)*	8635 *(38.41)*	6.17 *(9.93)*	2499	1.49	10.729 *(40.612)*	0.527 *(0.321)*	13.24 *(2.608)*	186 *(85.6)*	48 *(8.6)*	56 *(13.1)*	29.035 *(98.047)*
75% of Pull at Maximum Power—Ten Hours 6th (3LoDD) Gear											
114.49 *(85.37)*	6653 *(29.59)*	6.45 *(10.39)*	2603	1.14	9.349 *(35.392)*	0.570 *(0.347)*	12.25 *(2.412)*	186 *(85.7)*	57 *(13.7)*	66 *(18.9)*	28.825 *(97.338)*
50% of Pull at Maximum Power—Two Hours 6th (3LoDD) Gear											
78.01 *(58.18)*	4430 *(19.71)*	6.60 *(10.63)*	2663	1.14	7.755 *(29.357)*	0.694 *(0.422)*	10.06 *(1.982)*	182 *(83.3)*	39 *(3.6)*	39 *(3.9)*	28.965 *(97.810)*
50% of Pull at Reduced Engine Speed—Two Hours 8th (1HiDD) Gear											
77.45 *(57.75)*	4412 *(19.63)*	6.58 *(10.59)*	1874	1.05	5.928 *(22.442)*	0.534 *(0.325)*	13.06 *(2.573)*	181 *(82.8)*	37 *(2.8)*	38 *(3.1)*	29.020 *(97.996)*
MAXIMUM POWER IN SELECTED GEARS											
138.35 *(103.16)*	19069 *(84.83)*	2.72 *(4.38)*	2536	6.91	2nd (1LoDD) Gear			184 *(84.2)*	31 *(-0.5)*	34 *(1.1)*	29.170 *(98.503)*
143.22 *(106.80)*	14047 *(62.48)*	3.82 *(6.15)*	2500	2.92	3rd (2LoTA) Gear			186 *(85.3)*	46 *(7.8)*	53 *(11.7)*	29.060 *(98.131)*
144.40 *(107.68)*	12020 *(53.47)*	4.51 *(7.25)*	2500	2.14	4th (2LoDD) Gear			186 *(85.6)*	46 *(7.8)*	53 *(11.7)*	29.060 *(98.131)*
145.52 *(108.51)*	10386 *(46.20)*	5.25 *(8.46)*	2498	1.80	5th (3LoTA) Gear			186 *(85.3)*	45 *(7.2)*	52 *(11.1)*	29.080 *(98.199)*
145.66 *(108.62)*	8860 *(39.41)*	6.17 *(9.92)*	2497	1.54	6th (3LoDD) Gear			186 *(85.3)*	44 *(6.7)*	51 *(10.6)*	29.100 *(98.266)*
146.43 *(109.19)*	7331 *(32.61)*	7.49 *(12.05)*	2498	1.27	7th (1HiTA) Gear			186 *(85.6)*	47 *(8.3)*	54 *(12.2)*	29.050 *(98.097)*
145.24 *(108.31)*	6199 *(27.58)*	8.79 *(14.14)*	2500	1.10	8th (1HiDD) Gear			186 *(85.6)*	47 *(8.3)*	54 *(12.2)*	29.050 *(98.097)*

Department of Agricultural Engineering

Dates of Test: November 5-17, 1980

MANUFACTURER: INTERNATIONAL HARVESTER COMPANY, 401 North Michigan Avenue, Chicago, IL 60611.

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 47.9 (rating taken from oil company's inspection data) **Specific gravity corverted to 60°/60°** ***(15°/15°)*** 0.8382 **Fuel weight** 6.979 lbs/gal *(0.836 kg/l)* **Oil SAE** 30 **API service classification** CA/CD-SC/SE **To motor** 3.852 gal *(14.580 l)* **Drained from motor** 3.430 gal *(12.984 l)* **Transmission and final drive lubricant** I.H. Hytran fluid **Total time engine was operated** 38.0 hours

ENGINE Make International Diesel **Type** six cylinder vertical with turbocharger **Serial No.** 467TT2U123651* **Crankshaft** lengthwise **Rated rpm** 2500 **Bore and stroke** 4.300" × 5.350" *(109.2 mm × 135.9 mm)* **Compression ratio** 16.3 to 1 **Displacement** 466 cu in *(7639 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with aspirator **Oil filter** two paper cartridges **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil **Fuel filter** three paper cartridges **Muffler** underhood **Exhaust** vertical **Cooling medium temperature control** one thermostat

CHASSIS: Type four wheel drive **Serial No.** 290000IU 9347* **Tread width** rear 62.4" *(1585 mm)* to 115" *(2921 mm)* front 62.4" *(1585 mm)* to 115" *(2921 mm)* **Wheel base** 110" *(2794 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 58.6" *(1488 mm)* Vertical distance above roadway 42.2" *(1072 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with partial (2) range operator controlled powershift **Advertised speeds mph *(km/h)*** first 2.3 *(3.6)* second 2.6 *(4.2)* third 3.6 *(5.8)* fourth 4.2 *(6.8)* fifth 4.9 *(7.9)* sixth 5.7 *(9.2)* seventh 6.9 *(11.2)* eighth 8.1 *(13.0)* ninth 11.1 *(17.9)* tenth 13.0 *(20.9)* eleventh 15.1 *(24.3)* twelfth 17.7 *(28.4)* reverse 3.9 *(6.2)*, 4.5 *(7.3)*, 6.2 *(9.9)*, 7.2 *(11.6)*, 8.4 *(13.5)*, 9.8 *(15.8)* **Clutch** dry single disc hydraulically power actuated and operated by foot pedal **Brakes** wet multiple disc hydraulically activated and operated by foot pedal **Steering** hydrostatic and articulated **Turning radius** (on concrete surface without brake) right 222" *(5.64 m)* left 222" *(5.64 m)* **Turning space diameter** (on concrete surface without brake) right 477" *(12.12 m)* left 477" *(12.12 m)* **Power take-off** 1000 rpm at 2071 engine rpm.

LUGGING ABILITY IN 6th (3LoDD) GEAR

Crankshaft Speed rpm	2497	2248	2000	1753	1497	1249
Pull—lbs *(kN)*	8860 *(39.41)*	10159 *(45.19)*	10767 *(47.90)*	11360 *(50.53)*	10698 *(47.59)*	9984 *(44.41)*
Increase in Pull %	0	15	22	28	21	13
Power—Hp *(kW)*	145.66 *(108.62)*	150.02 *(111.87)*	141.16 *(105.26)*	130.31 *(97.17)*	105.01 *(78.30)*	81.86 *(61.04)*
Speed—Mph *(km/h)*	6.17 *(9.92)*	5.54 *(8.91)*	4.92 *(7.91)*	4.30 *(6.92)*	3.68 *(5.92)*	3.07 *(4.95)*
Slip %	1.54	1.71	1.88	2.06	1.88	1.88

TRACTOR SOUND LEVEL WITH CAB	dB(A)
Maximum Available Power—Two Hours	80.5
75% of Pull at Maximum Power—Ten Hours	80.5
50% of Pull at Maximum Power—Two Hours	80.5
50% of Pull at Reduced Engine Speed—Two Hours	78.5
Bystander in 11th (3HiTA) gear	88.5

TIRES, BALLAST AND WEIGHT		**With Ballast**	**Without Ballast**
Rear Tires	—No., size, ply & psi *(kPa)*	Two 20.8R38; 8; 16 *(110)*	Two 20.8R38; 8; 16 *(110)*
Ballast	—Liquid (each)	1065 lb *(483 kg)*	None
	—Cast Iron (each)	None	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 20.8R38; 8; 16 *(110)*	Two 20.8R38; 8; 16 *(110)*
*Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	35 lb *(16 kg)*	None
Height of Drawbar		15 in *(380 mm)*	15 in *(380 mm)*
Static Weight with Operator	—Rear	10880 lb *(4935 kg)*	8750 lb *(3969 kg)*
	Front	9940 lb *(4509 kg)*	9870 lb *(4477 kg)*
	Total	20820 lb *(9444 kg)*	18620 lb *(8446 kg)*

*This ballast represents test equipment added.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump return was 159°F *(70.4°C)*. Seven gears were chosen between 15% slip and 10 mph *(16.1 km/h)* The pull in 2nd (1LoDD) gear was limited to avoid tractor bouncing.

We, the undersigned, certify that this is a true and correct report of official Tractor Test **1377**.

LOUIS I. LEVITICUS
Engineer-in-Charge

G. W. STEINBRUEGGE, Chairman
W. E. SPLINTER
K. VON BARGEN
Board of Tractor Test Engineers

International 3788 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1378 — CASE 1190 MANUAL DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—650 rpm)									
	43.09	2200	2.932	0.477	14.70	200	54	75	28.950
	(32.13)		*(11.099)*	*(0.290)*	*(2.895)*	*(93.3)*	*(12.4)*	*(23.9)*	*(97.760)*
Standard Power take-off Speed (540 rpm)—One Hour									
	38.54	1827	2.570	0.467	14.99	208	54	75	28.945
	(28.74)		*(9.729)*	*(0.284)*	*(2.954)*	*(98.0)*	*(12.1)*	*(23.7)*	*(97.743)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	37.60	2259	2.488	0.464	15.12	188	54	76	......
	(28.04)		*(9.418)*	*(0.282)*	*(2.977)*	*(86.4)*	*(12.2)*	*(24.2)*	......
	0.00	2352	0.698	.....	.....	171	54	75	......
	(0.00)		*(2.642)*	.....	.....	*(76.9)*	*(12.2)*	*(23.9)*	......
	19.22	2310	1.434	0.523	13.40	176	54	75	......
	(14.33)		*(5.428)*	*(0.318)*	*(2.640)*	*(80.0)*	*(12.2)*	*(23.9)*	......
	42.84	2199	2.950	0.483	14.52	200	54	76	......
	(31.95)		*(11.167)*	*(0.294)*	*(2.861)*	*(93.3)*	*(12.2)*	*(24.2)*	......
	9.70	2332	1.058	0.764	9.17	175	54	76	......
	(7.23)		*(4.005)*	*(0.465)*	*(1.805)*	*(79.4)*	*(12.2)*	*(24.2)*	......
	28.47	2280	1.901	0.468	14.98	180	54	75	......
	(21.23)		*(7.196)*	*(0.285)*	*(2.950)*	*(81.9)*	*(12.2)*	*(23.9)*	......
Av	**22.97**	**2289**	**1.755**	**0.535**	**13.09**	**181**	**54**	**75**	**28.910**
Av	***(17.13)***		***(6.643)***	***(0.326)***	***(2.579)***	***(83.0)***	***(12.2)***	***(24.1)***	***(97.625)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 8th (4-1) Gear											
34.65	2512	5.17	2200	6.88	2.836	0.574	12.22	213	59	80	28.630
(25.84)	*(11.17)*	*(8.32)*			*(10.735)*	*(0.349)*	*(2.407)*	*(100.6)*	*(15.0)*	*(26.7)*	*(96.680)*
75% of Pull at Maximum Power—Ten Hours 8th (4-1) Gear											
28.62	1969	5.45	2271	4.98	2.273	0.556	12.59	191	62	68	28.103
(21.34)	*(8.76)*	*(8.77)*			*(8.604)*	*(0.338)*	*(2.480)*	*(88.3)*	*(16.7)*	*(20.0)*	*(94.900)*
50% of Pull at Maximum Power—Two Hours 8th (4-1) Gear											
19.71	1313	5.63	2309	3.51	1.730	0.615	11.39	188	37	42	28.675
(14.70)	*(5.84)*	*(9.06)*			*(6.549)*	*(0.374)*	*(2.244)*	*(86.7)*	*(2.8)*	*(5.6)*	*(96.830)*
50% of Pull at Reduced Engine Speed—Two Hours 10th (3-3) Gear											
19.67	1315	5.61	1602	3.42	1.445	0.515	13.61	183	39	45	28.735
(14.67)	*(5.85)*	*(9.03)*			*(5.470)*	*(0.313)*	*(2.681)*	*(83.9)*	*(3.9)*	*(7.2)*	*(97.030)*
MAXIMUM POWER IN SELECTED GEARS											
33.74	4620	2.74	2246	14.67	5th (1-3) Gear			188	40	47	28.780
(25.16)	*(20.55)*	*(4.41)*						*(86.7)*	*(4.4)*	*(8.3)*	*(97.190)*
33.93	3980	3.20	2199	11.94	6th (2-2) Gear			205	53	67	28.660
(25.30)	*(17.70)*	*(5.15)*						*(96.1)*	*(11.7)*	*(19.4)*	*(96.780)*
36.08	3212	4.21	2199	8.82	7th (3-2) Gear			203	53	66	28.660
(26.90)	*(14.29)*	*(6.78)*						*(95.0)*	*(11.7)*	*(18.9)*	*(96.780)*
36.21	2632	5.16	2200	7.07	8th (4-1) Gear			201	52	65	28.670
(27.00)	*(11.71)*	*(8.30)*						*(93.9)*	*(11.1)*	*(18.3)*	*(96.810)*
35.89	2285	5.89	2200	5.98	9th (2-3) Gear			203	53	69	28.660
(26.76)	*(10.16)*	*(9.48)*						*(95.0)*	*(11.7)*	*(20.6)*	*(96.780)*
36.60	1807	7.60	2200	4.69	10th (3-3) Gear			203	54	71	28.660
(27.29)	*(8.04)*	*(12.23)*						*(95.0)*	*(12.2)*	*(21.7)*	*(96.780)*
35.60	1510	8.84	2197	3.94	11th (4-2) Gear			203	55	73	28.660
(26.55)	*(6.72)*	*(14.23)*						*(95.0)*	*(12.8)*	*(22.8)*	*(96.780)*

Department of Agricultural Engineering

Dates of Test: March 27 to April 9, 1981

Manufacturer: J. I. CASE COMPANY, Racine, Wisconsin 53404

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8416 **Fuel weight** 7.007 lbs/gal *(0.840 kg/l)* **Oil SAE** 30 **API service classification** CD-SE **To motor** 1.658 gal *(6.276 l)* **Drained from motor** 1.470 gal *(5.565 l)* **Transmission lubricant** Case TFD fluid **Final drive lubricant** Case ETHB fluid **Total time engine was operated** 38.0 hours

ENGINE Make Case Diesel **Type** three cylinder vertical **Serial No.** 16500311310852 **Crankshaft** lengthwise **Rated rpm** 2200 **Bore and stroke** 3.939" × 4.500" *(100 mm × 114.3 mm)* **Compression ratio** 17 to 1 **Displacement** 165 cu in *(2705 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with centrifugal precleaner **Oil filter** one full flow cartridge **Fuel filter** two paper elements with sediment bowl and screen **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type standard **Serial No.** 1190/00/11030782 **Tread width** rear 56" *(1422 mm)* to 76" *(1930 mm)* front 52" *(1321 mm)* to 72" *(1829 mm)* **Wheel base** 77" *(1956 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 28.5" *(724 mm)* Vertical distance above roadway 28.8" *(732 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.1 *(1.8)* second 1.8 *(2.9)* third 2.2 *(3.5)* fourth 2.8 *(4.5)* fifth 3.2 *(5.1)* sixth 3.7 *(5.9)* seventh 4.7 *(7.5)* eighth 5.6 *(9.0)* ninth 6.3 *(10.2)* tenth 8.1 *(13.0)* eleventh 9.3 *(15.0)* twelfth 16.1 *(25.9)* reverse 1.8 *(2.9)*, 3.6 *(5.9)*, 4.6 *(7.3)*, 9.2 *(14.6)* **Clutch** single dry disc in combination with PTO clutch operated by foot pedal **Brakes** drum and shoe operated by two foot pedals which can be locked together and hand lever **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 114" *(2.90 m)* left 114" *(2.90 m)* (on concrete surface without brake) right 128" *(3.25 m)* left 128" *(3.25 m)* **Turning space diameter** (on concrete surface with brake applied) right 236" *(5.99 m)* left 236" *(5.99 m)* (on concrete surface without brake) right 264" *(6.71 m)* left 264" *(6.71 m)* **Power take-off** 540 rpm at 1827 engine rpm.

LUGGING ABILITY IN 8th (4-1) GEAR

Crankshaft Speed rpm	2200	1978	1757	1548	1311	1090
Pull—lbs *(kN)*	2632 *(11.71)*	2801 *(12.46)*	2944 *(13.10)*	3007 *(13.38)*	2977 *(13.24)*	2801 *(12.46)*
Increase in Pull %	0	6	12	14	13	6
Power—Hp *(kW)*	36.21 *(27.00)*	34.51 *(25.73)*	32.06 *(23.91)*	28.82 *(21.49)*	24.15 *(18.01)*	19.01 *(14.18)*
Speed—Mph *(km/h)*	5.16 *(8.30)*	4.62 *(7.44)*	4.08 *(6.57)*	3.59 *(5.78)*	3.04 *(4.89)*	2.54 *(4.09)*
Slip %	7.07	7.56	7.88	7.98	8.19	7.66

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	97.5
75% of Pull at Maximum Power—Ten Hours	94.5
50% of Pull at Maximum Power—Two Hours	93.0
50% of Pull at Reduced Engine Speed—Two Hours	91.0
Bystander in 12th (4-3) gear	85.5

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 13.6-28; 6; 20 *(140)*	Two 13.6-28; 6; 20 *(140)*
Ballast	—Liquid (each)	470 lb *(213 kg)*	None
	—Cast Iron (each)	605 lb *(274 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 6:00-16; 6; 32 *(220)*	Two 6:00-16; 6; 32 *(220)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	5 lb *(2 kg)*	None
Height of drawbar		17.5 in *(445 mm)*	17.5 in *(445 mm)*
Static Weight with Operator	—Rear	5060 lb *(2295 kg)*	2910 lb *(1320 kg)*
	Front	1720 lb *(780 kg)*	1710 lb *(776 kg)*
	Total	6780 lb *(3075 kg)*	4620 lb *(2096 kg)*

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 134°F *(56.7°C)*. Seven gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1378.**

LOUIS I. LEVITICUS
Engineer-in Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

Case 1190 Manual Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1379 — CASE 1290 MANUAL DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption			Temperature °F *(°C)*			Barometer inch Hg *(kPa)*
			gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling medium	Air wet bulb	Air dry bulb	
	MAXIMUM POWER AND FUEL CONSUMPTION								
	Rated Engine Speed—Two Hours (PTO Speed—650 rpm)								
	53.73 *(40.07)*	2200	3.617 *(13.792)*	0.472 *(0.287)*	14.86 *(2.927)*	187 *(86.3)*	56 *(13.4)*	75 *(23.7)*	29.043 *(98.075)*
	Standard Power take-off Speed (540 rpm)—One Hour								
	47.80 *(35.64)*	1827	3.144 *(11.901)*	0.462 *(0.281)*	15.20 *(2.995)*	195 *(90.6)*	57 *(13.8)*	75 *(24.1)*	29.040 *(98.064)*
	VARYING POWER AND FUEL CONSUMPTION—Two Hours								
	47.42 *(35.36)*	2286	3.078 *(11.651)*	0.456 *(0.277)*	15.41 *(3.035)*	179 *(81.7)*	55 *(12.5)*	74 *(23.3)*	....
	0.00 *(0.00)*	2362	0.864 *(3.271)*	....	....	162 *(72.2)*	54 *(12.2)*	74 *(23.1)*	....
	24.04 *(17.93)*	2318	1.791 *(6.780)*	0.523 *(0.318)*	13.42 *(2.645)*	164 *(73.3)*	54 *(12.2)*	75 *(23.6)*	....
	53.84 *(40.15)*	2200	3.621 *(13.707)*	0.472 *(0.287)*	14.87 *(2.929)*	187 *(86.1)*	54 *(12.2)*	75 *(23.9)*	....
	12.16 *(9.07)*	2341	1.308 *(4.951)*	0.755 *(0.459)*	9.29 *(1.832)*	164 *(73.1)*	54 *(12.2)*	75 *(23.9)*	....
	35.76 *(26.67)*	2296	2.322 *(8.790)*	0.456 *(0.277)*	15.41 *(3.034)*	174 *(78.9)*	54 *(12.2)*	75 *(23.9)*	....
Av ***Av***	**28.87** ***(21.53)***	**2300**	**2.164** ***(8.192)***	**0.526** ***(0.320)***	**13.34** ***(2.628)***	**172** ***(77.6)***	**54** ***(12.3)***	**75** ***(23.6)***	**29.010** ***(97.962)***

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F *(°C)*			Barom. inch Hg *(kPa)*
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 8th (4-1) Gear											
44.66 *(33.30)*	3367 *(14.98)*	4.98 *(8.01)*	2200	5.12	3.598 *(13.620)*	0.565 *(0.344)*	12.41 *(2.445)*	195 *(90.6)*	56 *(13.3)*	70 *(21.1)*	28.465 *(96.120)*
75% of Pull at Maximum Power—Ten Hours 8th (4-1) Gear											
37.14 *(27.70)*	2637 *(11.73)*	5.28 *(8.50)*	2301	3.72	2.879 *(10.898)*	0.544 *(0.331)*	12.90 *(2.542)*	178 *(81.1)*	47 *(8.3)*	57 *(13.9)*	28.533 *(96.350)*
50% of Pull at Maximum Power—Two Hours 8th (4-1) Gear											
25.17 *(18.77)*	1754 *(7.80)*	5.38 *(8.66)*	2316	2.58	2.155 *(8.158)*	0.600 *(0.365)*	11.68 *(2.301)*	173 *(78.3)*	49 *(9.4)*	63 *(17.2)*	28.955 *(97.780)*
50% of Pull at Reduced Engine Speed—Two Hours 10th (3-3) Gear											
25.21 *(18.80)*	1750 *(7.78)*	5.40 *(8.69)*	1617	2.38	1.728 *(6.541)*	0.481 *(0.293)*	14.59 *(2.874)*	180 *(82.2)*	52 *(10.8)*	69 *(20.3)*	28.945 *(97.740)*
MAXIMUM POWER IN SELECTED GEARS											
43.07 *(32.12)*	6851 *(30.47)*	2.36 *(3.80)*	2260	12.73	4th (3-1) Gear			181 *(82.8)*	44 *(6.7)*	53 *(11.7)*	28.960 *(97.790)*
43.36 *(32.33)*	6163 *(27.41)*	2.64 *(4.25)*	2199	10.92	5th (1-3) Gear			186 *(85.6)*	51 *(10.6)*	60 *(15.6)*	28.520 *(96.310)*
44.03 *(32.83)*	5270 *(23.44)*	3.13 *(5.04)*	2200	8.51	6th (2-2) Gear			191 *(88.3)*	50 *(10.0)*	58 *(14.4)*	28.520 *(96.310)*
46.14 *(34.41)*	4236 *(18.84)*	4.08 *(6.57)*	2200	6.34	7th (3-2) Gear			190 *(87.8)*	49 *(9.4)*	56 *(13.3)*	28.520 *(96.310)*
46.41 *(34.61)*	3500 *(15.57)*	4.97 *(8.00)*	2200	5.27	8th (4-1) Gear			183 *(83.9)*	44 *(6.7)*	49 *(9.4)*	28.520 *(96.310)*
44.64 *(33.29)*	2958 *(13.16)*	5.66 *(9.11)*	2200	4.38	9th (2-3) Gear			192 *(88.9)*	52 *(11.1)*	62 *(16.7)*	28.510 *(96.270)*
45.34 *(33.81)*	2333 *(10.38)*	7.29 *(11.73)*	2202	3.27	10th (3-3) Gear			192 *(88.9)*	53 *(11.7)*	63 *(17.2)*	28.520 *(96.310)*
44.17 *(32.94)*	1959 *(8.71)*	8.46 *(13.62)*	2198	2.61	11th (4-2) Gear			193 *(89.4)*	54 *(12.2)*	65 *(18.3)*	28.480 *(96.170)*

Department of Agricultural Engineering

Dates of Test: March 18 to April 13, 1981

Manufacturer: J. I. CASE COMPANY, Racine, Wisconsin 53404

FUEL, OIL AND TIME: **Fuel** No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8428 **Fuel weight** 7.017 lbs/gal *(0.841 kg/l)* **Oil SAE** 30 **API service classification** CD-SE **To motor** 2.188 gal *(8.282 l)* **Drained from motor** 1.772 gal *(6.708 l)* **Transmission lubricant** Case TFD fluid **Final drive lubricant** Case ETHB fluid **Front axle lubricant** Case FDL SAE 90 **Total time engine was operated** 44.5 hours

ENGINE **Make** Case Diesel **Type** four cylinder vertical **Serial No.** 195002 11340667 **Crankshaft** lengthwise **Rated rpm** 2200 **Bore and stroke** 3.939″ × 4.000″ *(100 mm × 101.6 mm)* **Compression ratio** 17 to 1 **Displacement** 195 cu in *(3197 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with centrifugal precleaner **Oil filter** one full flow cartridge **Fuel filter** two paper cartridges with sediment bowl and screen **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: **Type** front wheel assist **Serial No.** 1290/18/11050714 **Tread width** rear 56″ *(1422 mm)* to 84″ *(2134 mm)* front 60″ *(1524 mm)* to 72″ *(1829 mm)* **Wheel base** 84″ *(2134 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 36.4″ *(925 mm)* Vertical distance above roadway 30.4″ *(772 mm)* Horizontal distance from center of rear wheel tread 0″ *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.0 *(1.7)* second 1.7 *(2.8)* third 2.1 *(3.3)* fourth 2.6 *(4.2)* fifth 3.0 *(4.8)* sixth 3.4 *(5.5)* seventh 4.3 *(7.0)* eighth 5.2 *(8.4)* ninth 5.9 *(9.5)* tenth 7.5 *(12.0)* eleventh 8.7 *(14.0)* twelfth 15.0 *(24.0)* reverse 1.7 *(2.7)*, 3.4 *(5.4)*, 4.3 *(6.9)*, 8.6 *(13.8)* **Clutch** single dry disc operated by foot pedal **Brakes** drum and shoe operated by two foot pedals which can be locked together and hand lever **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 138″ *(3.51 m)* left 138″ *(3.51 m)* (on concrete surface without brake) right 178″ *(4.52 m)* left 178″ *(4.52 m)* **Turning space diameter** (on concrete surface with brake applied) right 296″ *(7.52 m)* left 296″ *(7.52 m)* (on concrete surface without brake) right 372″ *(9.45 m)* left 372″ *(9.45 m)* **Power take-off** 540 rpm at 1827 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

LUGGING ABILITY IN 8th (4-1) GEAR

Crankshaft Speed rpm	2200	1984	1756	1536	1318	1094
Pull—lbs *(kN)*	3500 *(15.57)*	3659 *(16.28)*	3778 *(16.81)*	3862 *(17.18)*	3810 *(16.95)*	3602 *(16.02)*
Increase in Pull %	0	5	8	10	9	3
Power—Hp *(kW)*	46.41 *(34.61)*	43.65 *(32.55)*	39.79 *(29.67)*	35.53 *(26.49)*	30.08 *(22.43)*	23.70 *(17.67)*
Speed—Mph *(km/h)*	4.97 *(8.00)*	4.47 *(7.19)*	3.95 *(6.36)*	3.45 *(5.55)*	2.96 *(4.76)*	2.47 *(3.98)*
Slip %	5.27	5.46	5.59	5.84	5.71	5.31

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	98.5	98.0
75% of Pull at Maximum Power—Ten Hours		97.5
50% of Pull at Maximum Power—Two Hours		95.5
50% of Pull at Reduced Engine Speed—Two Hours		93.5
Bystander in 12th (4-3) gear		90.0

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 8th (4-1) Gear											
44.81 *(33.41)*	3288 *(14.63)*	5.11 *(8.22)*	2200	3.88	3.527 *(13.351)*	0.552 *(0.336)*	12.70 *(2.502)*	197 *(91.7)*	57 *(13.9)*	75 *(23.9)*	28.420 *(95.970)*
MAXIMUM POWER IN SELECTED GEARS											
41.32 *(30.81)*	8445 *(37.57)*	1.84 *(2.96)*	2264	14.62	3rd (2-1) Gear			174 *(78.9)*	40 *(4.4)*	47 *(8.3)*	28.940 *(97.730)*
46.44 *(34.63)*	4160 *(18.50)*	4.19 *(6.74)*	2201	5.15	7th (3-2) Gear			190 *(87.8)*	48 *(8.9)*	55 *(12.8)*	28.520 *(96.310)*
45.89 *(34.22)*	3381 *(15.04)*	5.09 *(8.19)*	2200	4.18	8th (4-1) Gear			189 *(87.2)*	47 *(8.3)*	53 *(11.7)*	28.520 *(96.310)*

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 16.9/14-30; 6; 16 *(110)*	Two 16.9/14-30; 6; 16 *(110)*
Ballast	—Liquid (each)	620 lb *(281 kg)*	None
	—Cast Iron (each)	722 lb *(327 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 9.5-24; 6; 24 *(165)*	Two 9.5-24; 6; 24 *(165)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	33 lb *(15 kg)*	None
Height of drawbar		18 in *(455 mm)*	18 in *(455 mm)*
Static Weight with Operator	—Rear	6500 lb *(2948 kg)*	3815 lb *(1731 kg)*
	Front	2820 lb *(1279 kg)*	2755 lb *(1250 kg)*
	Total	9320 lb *(4227 kg)*	6570 lb *(2981 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 157°F *(69.3°C)*. Eight gears were chosen between tire tangential pull limit (front wheel disengaged), 15% slip (front wheel drive engaged), and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1379.**

LOUIS I. LEVITICUS
Engineer-in Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

Case 1290 Manual Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1380 — CASE 1390 MANUAL DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
	MAXIMUM POWER AND FUEL CONSUMPTION								
	Rated Engine Speed—Two Hours (PTO Speed—1075 rpm)								
	60.59 *(45.18)*	2200	3.969 *(15.024)*	0.459 *(0.279)*	15.27 *(3.007)*	212 *(99.9)*	58 *(14.5)*	75 *(24.0)*	28.785 *(97.203)*
	Standard Power Take-off Speed (1000 rpm)—One Hour								
	58.40 *(43.55)*	2047	3.748 *(14.188)*	0.450 *(0.274)*	15.58 *(3.069)*	213 *(100.8)*	58 *(14.4)*	75 *(23.9)*	28.760 *(97.118)*
	VARYING POWER AND FUEL CONSUMPTION—Two Hours								
	53.65 *(40.01)*	2293	3.468 *(13.128)*	0.453 *(0.276)*	15.47 *(3.048)*	196 *(90.8)*	58 *(14.4)*	75 *(23.9)*	....
	0.00 *(0.00)*	2360	1.028 *(3.891)*	....	....	171 *(77.2)*	58 *(14.2)*	75 *(23.6)*	....
	27.09 *(20.20)*	2314	2.012 *(7.616)*	0.520 *(0.317)*	13.46 *(2.652)*	176 *(80.0)*	58 *(14.4)*	75 *(23.9)*	....
	60.59 *(45.18)*	2200	3.977 *(15.055)*	0.460 *(0.280)*	15.24 *(3.001)*	210 *(98.6)*	58 *(14.4)*	76 *(24.2)*	....
	13.69 *(10.21)*	2342	1.494 *(5.655)*	0.765 *(0.465)*	9.16 *(1.805)*	173 *(78.1)*	58 *(14.4)*	76 *(24.2)*	....
	40.16 *(29.95)*	2288	2.633 *(9.967)*	0.460 *(0.280)*	15.25 *(3.005)*	179 *(81.4)*	58 *(14.2)*	75 *(23.6)*	....
Av ***Av***	**32.53** ***(24.26)***	**2300**	**2.435** ***(9.217)***	**0.525** ***(0.319)***	**13.36** ***(2.632)***	**184** ***(84.3)***	**58** ***(14.3)***	**75** ***(23.9)***	**28.770** ***(96.139)***

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cooling med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 8th (4-1) Gear											
50.38 *(37.57)*	3834 *(17.05)*	4.93 *(7.93)*	2200	6.10	3.907 *(14.789)*	0.543 *(0.331)*	12.89 *(2.541)*	208 *(97.5)*	51 *(10.6)*	69 *(20.6)*	28.810 *(97.290)*
75% of Pull at Maximum Power—Ten Hours 8th (4-1) Gear											
41.23 *(30.75)*	2978 *(13.25)*	5.19 *(8.35)*	2275	4.31	3.115 *(11.792)*	0.529 *(0.322)*	13.24 *(2.608)*	186 *(85.6)*	53 *(11.7)*	66 *(18.9)*	28.600 *(96.570)*
50% of Pull at Maximum Power—Two Hours 8th (4-1) Gear											
28.35 *(21.14)*	1988 *(8.84)*	5.35 *(8.61)*	2314	3.02	2.408 *(9.115)*	0.595 *(0.362)*	11.77 *(2.319)*	181 *(82.8)*	50 *(10.0)*	58 *(14.4)*	28.750 *(97.080)*
50% of Pull at Reduced Engine Speed—Two Hours 10th (3-3) Gear											
28.27 *(21.08)*	1981 *(8.81)*	5.35 *(8.61)*	1610	2.88	1.962 *(7.428)*	0.486 *(0.296)*	14.40 *(2.838)*	182 *(83.3)*	52 *(10.8)*	64 *(17.8)*	28.790 *(97.220)*
MAXIMUM POWER IN SELECTED GEARS											
45.36 *(33.82)*	7348 *(32.69)*	2.31 *(3.72)*	2254	14.19	4th (3-1) Gear			181 *(82.8)*	45 *(7.2)*	50 *(10.0)*	28.690 *(96.880)*
48.67 *(36.29)*	7131 *(31.72)*	2.56 *(4.12)*	2200	13.72	5th (1-3) Gear			177 *(80.6)*	46 *(7.8)*	52 *(11.1)*	28.700 *(96.920)*
49.39 *(36.83)*	6033 *(26.84)*	3.07 *(4.94)*	2200	10.39	6th (2-2) Gear			194 *(90.0)*	48 *(8.9)*	62 *(16.7)*	28.940 *(97.730)*
51.61 *(38.49)*	4800 *(21.35)*	4.03 *(6.49)*	2200	7.59	7th (3-2) Gear			191 *(88.3)*	48 *(8.9)*	61 *(16.1)*	28.950 *(97.760)*
52.16 *(38.90)*	3974 *(17.68)*	4.92 *(7.92)*	2200	6.19	8th (4-1) Gear			182 *(83.3)*	44 *(6.7)*	55 *(12.8)*	28.990 *(97.890)*
50.92 *(37.97)*	3407 *(15.16)*	5.60 *(9.02)*	2198	[illegible].19	9th (2-3) Gear			198 *(92.2)*	48 *(8.9)*	63 *(17.2)*	28.930 *(97.690)*
51.97 *(38.75)*	2696 *(11.99)*	7.23 *(11.64)*	2200	3.97	10th (3-3) Gear			198 *(92.2)*	49 *(9.4)*	65 *(18.3)*	28.920 *(97.660)*
50.49 *(37.65)*	2250 *(10.01)*	8.42 *(13.55)*	2200	3.31	11th (4-2) Gear			201 *(93.9)*	50 *(10.0)*	67 *(19.4)*	28.900 *(97.590)*

Department of Agricultural Engineering

Dates of Test: March 25 to April 10, 1980

Manufacturer: J. I. CASE COMPANY, Racine, Wisconsin 53404

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8416 **Fuel weight** 7.007 lbs/gal *(0.840 kg/l)* **Oil SAE** 30 **API service classification** CD-SE **To motor** 1.789 gal *(6.772 l)* **Drained from motor** 1.496 gal *(5.663 l)* **Transmission lubricant** Case TFD fluid **Final drive lubricant** Case ETHB fluid **Front axle lubricant** Case FDL SAE 90 **Total time engine was operated** 38.0 hours

ENGINE Make Case Diesel **Type** four cylinder vertical **Serial No.** 220002 11371030 **Crankshaft** lengthwise **Rated rpm** 2200 **Bore and stroke** 3.939" × 4.500" *(100 mm × 114.3 mm)* **Compression ratio** 17 to 1 **Displacement** 219 cu in *(3590 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with centrifugal precleaner **Oil filter** one full flow cartridge **Fuel filter** two paper elements with sediment bowl and screen **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type front wheel assist **Serial No.** 1390/18/11121736 **Tread width** rear 56" *(1422 mm)* to 84" *(2134 mm)* front 60" *(1524 mm)* to 72" *(1829 mm)* **Wheel base** 84" *(2134 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 36.2" *(920 mm)* Vertical distance above roadway 31.3" *(795 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.0 *(1.7)* second 1.7 *(2.8)* third 2.1 *(3.3)* fourth 2.6 *(4.2)* fifth 3.0 *(4.8)* sixth 3.4 *(5.5)* seventh 4.3 *(7.0)* eighth 5.2 *(8.4)* ninth 5.9 *(9.5)* tenth 7.5 *(12.0)* eleventh 8.7 *(14.0)* twelfth 15.0 *(24.0)* reverse 1.7 *(2.7)*, 3.4 *(5.4)*, 4.3 *(6.9)*, 8.6 *(13.8)* **Clutch** single dry disc operated by foot pedal **Brakes** drum and shoe operated by two foot pedals which can be locked together and hand lever **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 138" *(3.51 m)* left 138" *(3.51 m)* (on concrete surface without brake) right 178" *(4.52 m)* left 178" *(4.52 m)* **Turning space diameter** (on concrete surface with brake applied) right 296" *(7.52 m)* left 296" *(7.52 m)* (on concrete surface without brake) right 372" *(9.45 m)* left 372" *(9.45 m)* **Power take-off** 1000 rpm at 2047 engine rpm and 540 rpm at 2077 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

LUGGING ABILITY IN 8th (4-1) GEAR

Crankshaft Speed rpm	2200	1978	1756	1540	1312	1094
Pull—lbs *(kN)*	3974 *(17.68)*	4228 *(18.81)*	4451 *(19.80)*	4452 *(19.80)*	4540 *(20.19)*	4352 *(19.36)*
Increase in Pull %	0	6	12	12	14	10
Power—Hp *(kW)*	52.16 *(38.90)*	49.66 *(37.03)*	46.24 *(34.48)*	40.46 *(30.17)*	35.18 *(26.23)*	28.20 *(21.03)*
Speed—Mph *(km/h)*	4.92 *(7.92)*	4.40 *(7.08)*	3.90 *(6.28)*	3.41 *(5.49)*	2.91 *(4.68)*	2.43 *(3.91)*
Slip %	6.19	6.50	6.91	7.11	7.11	6.87

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	99.0	99.0
75% of Pull at Maximum Power—Ten Hours		96.0
50% of Pull at Maximum Power—Two Hours		94.0
50% of Pull at Reduced Engine Speed—Two Hours		93.0
Bystander in 12th (4-3) gear		88.0

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 8th (4-1) Gear											
50.26 *(37.48)*	3726 *(16.57)*	5.06 *(8.14)*	2200	4.71	3.960 *(14.991)*	0.552 *(0.336)*	12.69 *(2.500)*	214 *(101.1)*	54 *(11.9)*	73 *(22.5)*	28.770 *(97.140)*
MAXIMUM POWER IN SELECTED GEARS											
42.17 *(31.45)*	8624 *(38.36)*	1.83 *(2.95)*	2262	14.71	3rd (2-1) Gear			175 *(79.4)*	44 *(6.7)*	49 *(9.4)*	28.680 *(96.850)*
52.03 *(38.80)*	3863 *(17.18)*	5.05 *(8.13)*	2200	5.00	8th (4-1) Gear			190 *(87.8)*	47 *(8.3)*	60 *(15.6)*	28.960 *(97.790)*

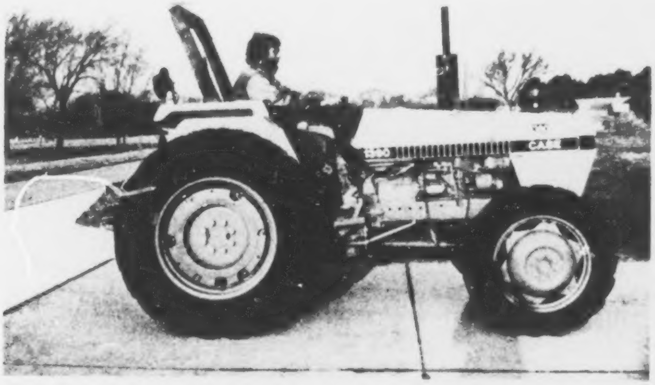
TIRES, BALLAST AND WEIGHT		**With Ballast**	**Without Ballast**
Rear Tires	—No., size, ply & psi *(kPa)*	Two 16.9/14-30; 6; 18 *(125)*	Two 16.9/14-30; 6; 18 *(125)*
Ballast	—Liquid (each)	550 lb *(249 kg)*	None
	—Cast Iron (each)	1000 lb *(454 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 9.5-24; 6; 24 *(165)*	Two 9.5-24; 6; 24 *(165)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	30 lb *(14 kg)*	None
Height of drawbar		17.5 in *(445 mm)*	17.5 in *(445 mm)*
Static Weight with Operator	—Rear	6940 lb *(3148 kg)*	3840 lb *(1742 kg)*
	Front	2840 lb *(1288 kg)*	2780 lb *(1261 kg)*
	Total	9780 lb *(4436 kg)*	6620 lb *(3003 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 159°F *(70.5°C)*. Eight gears were chosen between tire tangential pull limit (front wheel disengaged), 15% slip (front wheel drive engaged), and 10 mph *(16.1 km/h)*. During final inspection a single groove was found reaching the top of cylinder wall No. 4.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1380.**

LOUIS I. LEVITICUS
Engineer-in Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers



Case 1390 Manual Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1381 — CASE 1490 MANUAL DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption			Temperature °F *(°C)*			Barometer inch Hg *(kPa)*
		gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—1075 rpm)								
70.51 *(52.58)*	2200	4.232 *(16.020)*	0.421 *(0.256)*	16.66 *(3.282)*	182 *(83.2)*	51 *(10.6)*	75 *(23.8)*	28.863 *(97.467)*
Standard Power Take-off Speed (1000 rpm)—One Hour								
68.75 *(51.27)*	2047	4.002 *(15.149)*	0.408 *(0.248)*	17.18 *(3.384)*	182 *(83.1)*	51 *(10.6)*	75 *(23.8)*	28.845 *(97.405)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
62.57 *(46.66)*	2296	3.932 *(14.884)*	0.441 *(0.268)*	15.91 *(3.135)*	180 *(82.2)*	51 *(10.6)*	75 *(23.9)*	....
0.00 *(0.00)*	2358	1.155 *(4.372)*	....	....	172 *(77.5)*	51 *(10.6)*	75 *(23.6)*	....
31.49 *(23.48)*	2310	2.422 *(9.168)*	0.539 *(0.328)*	13.00 *(2.561)*	177 *(80.6)*	51 *(10.6)*	75 *(23.6)*	....
70.79 *(52.79)*	2200	4.258 *(16.118)*	0.422 *(0.257)*	16.63 *(3.275)*	182 *(83.3)*	51 *(10.6)*	75 *(23.9)*	....
15.80 *(11.78)*	2322	1.780 *(6.738)*	0.790 *(0.481)*	8.88 *(1.748)*	173 *(78.1)*	51 *(10.3)*	75 *(23.6)*	....
46.77 *(34.88)*	2288	3.149 *(11.920)*	0.472 *(0.287)*	14.85 *(2.926)*	177 *(80.6)*	53 *(11.7)*	76 *(24.2)*	....
Av 37.90 ***Av (28.26)***	**2296**	**2.783** ***(10.535)***	**0.515** ***(0.313)***	**13.62** ***(2.682)***	**177** ***(80.4)***	**51** ***(10.7)***	**75** ***(23.8)***	**28.775** ***(97.169)***

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F *(°C)*			Barom inch Hg *(kPa)*
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 7th (3-2) Gear											
59.12 *(44.09)*	4864 *(21.64)*	4.56 *(7.34)*	2198	6.52	4.279 *(16.198)*	0.507 *(0.308)*	13.82 *(2.722)*	188 *(86.7)*	47 *(8.3)*	61 *(16.1)*	29.035 *(98.000)*
75% of Pull at Maximum Power—Ten Hours 7th (3-2) Gear											
48.22 *(35.96)*	3707 *(16.49)*	4.88 *(7.85)*	2306	4.67	3.708 *(14.036)*	0.539 *(0.328)*	13.00 *(2.561)*	186 *(85.6)*	51 *(10.4)*	60 *(15.6)*	28.980 *(97.860)*
50% of Pull at Maximum Power—Two Hours 7th (3-2) Gear											
33.49 *(24.97)*	2499 *(11.12)*	5.03 *(8.10)*	2339	3.16	2.977 *(11.269)*	0.623 *(0.379)*	11.25 *(2.216)*	184 *(84.4)*	50 *(9.7)*	60 *(15.6)*	29.040 *(98.050)*
50% of Pull at Reduced Engine Speed—Two Hours 9th (2-3) Gear											
33.42 *(24.92)*	2486 *(11.06)*	5.04 *(8.11)*	1720	3.05	2.336 *(8.843)*	0.490 *(0.298)*	14.31 *(2.819)*	182 *(83.3)*	51 *(10.6)*	68 *(20.0)*	28.990 *(97.890)*
MAXIMUM POWER IN SELECTED GEARS											
56.63 *(42.23)*	8340 *(37.10)*	2.55 *(4.10)*	2195	14.31	4th (3-1) Gear			186 *(85.6)*	46 *(7.8)*	51 *(10.6)*	29.050 *(98.100)*
56.79 *(42.35)*	7160 *(31.85)*	2.97 *(4.79)*	2199	10.76	5th (1-3) Gear			188 *(86.7)*	46 *(7.8)*	58 *(14.4)*	29.070 *(98.170)*
58.21 *(43.41)*	6200 *(27.58)*	3.52 *(5.66)*	2200	8.51	6th (2-2) Gear			189 *(87.2)*	46 *(7.8)*	58 *(14.4)*	29.070 *(98.170)*
60.24 *(44.92)*	4960 *(22.06)*	4.56 *(7.34)*	2200	6.69	7th (3-2) Gear			188 *(86.7)*	45 *(7.2)*	56 *(13.3)*	29.200 *(98.600)*
60.45 *(45.08)*	4024 *(17.90)*	5.63 *(9.07)*	2202	5.08	8th (4-1) Gear			187 *(86.1)*	45 *(7.2)*	56 *(13.3)*	29.200 *(98.600)*
58.71 *(43.78)*	3471 *(15.44)*	6.34 *(10.21)*	2199	4.51	9th (2-3) Gear			188 *(86.7)*	46 *(7.8)*	58 *(14.4)*	29.070 *(98.170)*
59.05 *(44.03)*	2722 *(12.11)*	8.14 *(13.10)*	2201	3.57	10th (3-3) Gear			188 *(86.7)*	46 *(7.8)*	58 *(14.4)*	29.070 *(98.170)*

Department of Agricultural Engineering

Dates of Test: March 17-April 2, 1981

Manufacturer: J. I. CASE COMPANY, Racine, Wisconsin 53404

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60° *(15°/15°)*** 0.8420 **Fuel weight** 7.011 lbs/gal *(0.840 kg/l)* **Oil SAE** 30 **API service classification** CD-SE **To motor** 2.398 gal *(9.077 l)* **Drained from motor** 1.834 gal *(6.942 l)* **Transmission lubricant** Case TFD fluid **Final drive lubricant** Case ETHB fluid **Front axle lubricant** Case FDL SAE 90 **Total time engine was operated** 45.0 hours

ENGINE Make Case Diesel **Type** four cylinder vertical with turbocharger **Serial No.** 220102 11410775 **Crankshaft** lengthwise **Rated rpm** 2200 **Bore and stroke** 3.939" × 4.500" *(100 mm × 114.3 mm)* **Compression ratio** 16 to 1 **Displacement** 219 cu in *(3590 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with centrifugal precleaner **Oil filter** one full flow cartridge **Fuel filter** two paper elements with sediment bowl and screen **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type front wheel assist **Serial No.** 1490/18/11181306 **Tread width** rear 60.75" *(1543 mm)* to 85" *(2159 mm)* front 59" *(1499 mm)* to 71" *(1803 mm)* **Wheel base** 88" *(2235 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 37.0" *(940 mm)* Vertical distance above roadway 33.0" *(838 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.1 *(1.8)* second 1.8 *(2.9)* third 2.2 *(3.6)* fourth 2.8 *(4.6)* fifth 3.2 *(5.2)* sixth 3.7 *(5.9)* seventh 4.7 *(7.5)* eighth 5.7 *(9.2)* ninth 6.4 *(10.3)* tenth 8.1 *(13.0)* eleventh 9.3 *(15.0)* twelfth 16.1 *(25.9)* reverse 1.9 *(3.0)*, 3.8 *(6.0)*, 4.8 *(7.7)*, 9.5 *(15.3)* **Clutch** single dry disc hydraulically operated by foot pedal **Brakes** multiple wet disc hydraulically operated by two foot pedals which can be locked together and hand lever **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 147" *(3.73 m)* left 147" *(3.73 m)* (on concrete surface without brake) right 192" *(4.88 m)* left 192" *(4.88 m)* **Turning space diameter** (on concrete surface with brake applied) right 308" *(7.82 m)* left 308" *(7.82 m)* (on concrete surface without brake) right 398" *(10.11 m)* left 398" *(10.11 m)* **Power take-off** 1000 rpm at 2047 engine rpm and 540 rpm at 2077 engine rpm.

LUGGING ABILITY IN 7th (3-2) GEAR

Crankshaft Speed rpm	2200	1979	1759	1537	1320	1098
Pull—lbs *(kN)*	4960 *(22.06)*	5363 *(23.86)*	5591 *(24.87)*	5768 *(25.66)*	5721 *(25.45)*	5419 *(24.10)*
Increase in Pull %	0	8	13	16	15	9
Power—Hp *(kW)*	60.24 *(44.92)*	58.20 *(43.40)*	53.69 *(40.04)*	48.20 *(35.94)*	41.14 *(30.68)*	32.56 *(24.28)*
Speed—Mph *(km/h)*	4.56 *(7.34)*	4.07 *(6.55)*	3.60 *(5.79)*	3.13 *(5.04)*	2.70 *(4.35)*	2.25 *(3.62)*
Slip %	6.69	7.37	7.77	8.04	7.91	7.50

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	93.5	94.0
75% of Pull at Maximum Power—Ten Hours		93.0
50% of Pull at Maximum Power—Two Hours		92.5
50% of Pull at Reduced Engine Speed—Two Hours		90.0
Bystander in 12th (4-3) gear		84.0

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	Fuel Consumption lb/hp.hr *(kg/kW.h)*	Fuel Consumption Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Temp. °F *(°C)* Air wet bulb	Temp. °F *(°C)* Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 7th (3-2) Gear											
60.31 *(44.97)*	4831 *(21.49)*	4.68 *(7.53)*	2199	4.71	4.297 *(16.266)*	0.500 *(0.304)*	14.04 *(2.766)*	189 *(87.2)*	48 *(8.6)*	61 *(16.1)*	29.000 *(97.930)*
MAXIMUM POWER IN SELECTED GEARS											
55.20 *(41.16)*	9919 *(44.12)*	2.09 *(3.36)*	2275	14.68	3rd (2-1) Gear			187 *(86.1)*	44 *(6.7)*	50 *(10.0)*	29.050 *(98.100)*
61.52 *(45.88)*	4931 *(21.93)*	4.68 *(7.53)*	2200	4.82	7th (3-2) Gear			188 *(86.7)*	45 *(7.2)*	56 *(13.3)*	29.200 *(98.600)*

TIRES, BALLAST AND WEIGHT		**With Ballast**	**Without Ballast**
Rear Tires	—No., size, ply & psi *(kPa)*	Two 18.4-34; 6; 16 *(110)*	Two 18.4-34; 6; 16 *(110)*
Ballast	—Liquid (each)	1218 lb *(552 kg)*	None
	—Cast Iron (each)	500 lb *(227 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 12.4R24; 6; 24 *(165)*	Two 12.4R24; 6; 24 *(165)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	82 lb *(37 kg)*	None
Height of drawbar		20 in *(510 mm)*	20 in *(510 mm)*
Static Weight with Operator	—Rear	7965 lb *(3613 kg)*	4530 lb *(2055 kg)*
	Front	3340 lb *(1515 kg)*	3175 lb *(1440 kg)*
	Total	11305 lb *(5128 kg)*	7705 lb *(3495 kg)*

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 155°F *(68.1°C)*. Seven gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1381.**

LOUIS I. LEVITICUS
Engineer-in Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

Case 1490 Manual Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1382 — CASE 1490 POWERSHIFT DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—1075 rpm)								
70.91 *(52.88)*	2200	4.544 *(17.201)*	0.449 *(0.273)*	15.60 *(3.074)*	190 *(87.7)*	55 *(12.9)*	75 *(24.1)*	29.020 *(97.996)*
Standard Power take-off Speed (1000 rpm)—One Hour								
70.48 *(52.56)*	2048	4.292 *(16.247)*	0.427 *(0.260)*	16.42 *(3.235)*	190 *(87.6)*	55 *(12.9)*	75 *(23.9)*	29.000 *(97.929)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
62.57 *(46.66)*	2285	4.253 *(16.099)*	0.477 *(0.290)*	14.71 *(2.898)*	183 *(83.9)*	55 *(12.8)*	75 *(23.9)*	....
0.00 *(0.00)*	2368	1.472 *(5.572)*	....	....	172 *(77.8)*	55 *(12.8)*	74 *(23.3)*	....
31.99 *(23.85)*	2334	2.764 *(10.463)*	0.606 *(0.369)*	11.57 *(2.279)*	175 *(79.4)*	55 *(12.8)*	75 *(23.6)*	....
71.86 *(53.59)*	2202	4.596 *(17.398)*	0.448 *(0.273)*	15.64 *(3.080)*	190 *(87.5)*	56 *(13.3)*	76 *(24.4)*	....
16.11 *(12.01)*	2350	2.045 *(7.741)*	0.890 *(0.541)*	7.88 *(1.551)*	174 *(78.6)*	56 *(13.3)*	76 *(24.2)*	....
47.45 *(35.38)*	2310	3.479 *(13.169)*	0.514 *(0.313)*	13.64 *(2.687)*	179 *(81.7)*	55 *(12.8)*	75 *(23.9)*	....
Av 38.33 ***Av (28.58)***	**2308**	**3.102** ***(11.742)***	**0.567** ***(0.345)***	**12.36** ***(2.434)***	**179** ***(81.5)***	**55** ***(12.9)***	**75** ***(23.9)***	**28.997** ***(97.917)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 7th (2-3) Gear											
60.12 *(44.83)*	4656 *(20.71)*	4.85 *(7.81)*	2199	6.61	4.582 *(17.345)*	0.534 *(0.325)*	13.12 *(2.585)*	192 *(88.9)*	54 *(12.5)*	66 *(18.9)*	28.795 *(97.240)*
75% of Pull at Maximum Power—Ten Hours 7th (2-3) Gear											
48.90 *(36.46)*	3569 *(15.88)*	5.14 *(8.27)*	2290	4.89	4.072 *(15.414)*	0.584 *(0.355)*	12.01 *(2.366)*	187 *(86.1)*	56 *(13.1)*	62 *(16.7)*	28.800 *(97.250)*
50% of Pull at Maximum Power—Two Hours 7th (2-3) Gear											
33.47 *(24.96)*	2374 *(10.56)*	5.29 *(8.51)*	2316	3.25	3.281 *(12.420)*	0.687 *(0.418)*	10.20 *(2.009)*	185 *(85.0)*	58 *(14.2)*	65 *(18.3)*	28.645 *(96.730)*
50% of Pull at Reduced Engine Speed—Two Hours 9th (2-4) Gear											
33.55 *(25.02)*	2368 *(10.53)*	5.31 *(8.55)*	1702	3.17	2.496 *(9.448)*	0.522 *(0.318)*	13.44 *(2.648)*	181 *(82.8)*	59 *(15.0)*	68 *(20.0)*	28.630 *(96.680)*
MAXIMUM POWER IN SELECTED GEARS											
52.22 *(38.94)*	8405 *(37.39)*	2.33 *(3.75)*	2275	14.78	4th (1-4) Gear			188 *(86.7)*	46 *(7.8)*	50 *(10.0)*	28.860 *(97.460)*
55.18 *(41.15)*	8267 *(36.77)*	2.50 *(4.03)*	2202	14.60	5th (2-1) Gear			189 *(87.2)*	48 *(8.9)*	54 *(12.2)*	28.850 *(97.420)*
59.15 *(44.11)*	6088 *(27.08)*	3.64 *(5.86)*	2201	8.87	6th (2-2) Gear			190 *(87.8)*	51 *(10.6)*	58 *(14.4)*	28.850 *(97.420)*
61.10 *(45.56)*	4727 *(21.03)*	4.85 *(7.81)*	2200	6.65	7th (2-3) Gear			190 *(87.8)*	48 *(8.9)*	54 *(12.2)*	28.850 *(97.420)*
59.58 *(44.43)*	3404 *(15.14)*	6.56 *(10.46)*	2201	4.74	8th (3-1) Gear			190 *(87.8)*	52 *(11.1)*	59 *(15.0)*	28.840 *(97.390)*
61.56 *(45.91)*	3415 *(15.19)*	6.76 *(10.88)*	2199	4.74	9th (2-4) Gear			190 *(87.8)*	53 *(11.7)*	60 *(15.6)*	28.830 *(97.350)*
58.69 *(43.77)*	2420 *(10.76)*	9.10 *(14.65)*	2200	3.28	10th (3-2) Gear			190 *(87.8)*	53 *(11.7)*	61 *(16.1)*	28.820 *(97.320)*

Department of Agricultural Engineering

Dates of Test: March 18-April 2, 1981

Manufacturer: J. I. CASE COMPANY, Racine, Wisconsin 53404

FUEL, OIL AND TIME: **Fuel** No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** ***(15°/15°)*** 0.8420 **Fuel weight** 7.011 lbs/gal *(0.840 kg/l)* **Oil SAE** 30 **API service classification** CD-SE **To motor** 2.520 gal *(9.535 l)* **Drained from motor** 1.813 gal *(6.863 l)* **Transmission lubricant** Case TFD fluid **Final drive lubricant** Case ETHB fluid **Total time engine was operated** 37.0 hours

ENGINE **Make** Case Diesel **Type** four cylinder vertical with turbocharger **Serial No.** 220101 11410830 **Crankshaft** lengthwise **Rated rpm** 2200 **Bore and stroke** 3.939" × 4.500" *(100 mm × 114.3 mm)* **Compression ratio** 16 to 1 **Displacement** 219 cu in *(3590 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with centrifugal precleaner **Oil filter** one full flow cartridge **Fuel filter** two paper elements with sediment bowl and screen **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: **Type** standard **Serial No.** 1490/53/11181533 **Tread width** rear 60.75" *(1543 mm)* to 85" *(2159 mm)* front 60" *(1524 mm)* to 88" *(2235 mm)* **Wheel base** 88" *(2235 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 29.7" *(754 mm)* Vertical distance above roadway 37.7" *(958 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with partial (4) range operator controlled powershift **Advertised speeds mph *(km/h)*** first 1.0 *(1.6)* second 1.4 *(2.2)* third 1.8 *(2.9)* fourth 2.5 *(4.0)* fifth 2.8 *(4.5)* sixth 3.8 *(6.1)* seventh 5.0 *(8.0)* eighth 6.6 *(10.6)* ninth 6.8 *(10.9)* tenth 9.0 *(14.4)* eleventh 11.7 *(18.8)* twelfth 16.0 *(25.7)* reverse 2.9 *(4.6)*, 4.0 *(6.4)*, 5.1 *(8.2)*, 7.0 *(11.3)* **Clutch** single dry disc hydraulically operated by foot pedal **Brakes** multiple wet disc hydraulically operated by two foot pedals which can be locked together and hand lever **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 143" *(3.63 m)* left 143" *(3.63 m)* (on concrete surface without brake) right 158" *(4.01 m)* left 158" *(4.01 m)* **Turning space diameter** (on concrete surface with brake applied) right 298" *(7.57 m)* lef 298" *(7.57 m)* (on concrete surface without brake) right 328" *(8.33 m)* left 328" *(8.33 m)* **Power take-off** 1000 rpm at 2048 engine rpm and 540 rpm at 2077 engine rpm.

LUGGING ABILITY IN 7th (2-3) GEAR

Crankshaft Speed rpm	2200	1983	1758	1536	1309	1094
Pull—lbs *(kN)*	4727 *(21.03)*	5170 *(23.00)*	5462 *(24.30)*	5614 *(24.97)*	5561 *(24.74)*	5347 *(23.78)*
Increase in Pull %	0	9	16	19	18	13
Power—Hp *(kW)*	61.10 *(45.56)*	59.84 *(44.62)*	55.75 *(41.57)*	49.97 *(37.26)*	42.20 *(31.47)*	34.05 *(25.39)*
Speed—Mph *(km/h)*	4.85 *(7.81)*	4.34 *(6.98)*	3.83 *(6.16)*	3.34 *(5.38)*	2.85 *(4.59)*	2.39 *(3.85)*
Slip %	6.65	7.19	7.74	8.01	8.01	7.47

TRACTOR SOUND LEVEL WITH CAB	dB(A)
Maximum Available Power—Two Hours	80.5
75% of Pull at Maximum Power—Ten Hours	81.5
50% of Pull at Maximum Power—Two Hours	81.0
50% of Pull at Reduced Engine Speed—Two Hours	79.0
Bystander in 12th (3-4) gear	83.0

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 18.4-34; 6; 16 *(110)*	Two 18.4-34; 6; 16 *(110)*
Ballast	—Liquid (each)	1042 lb *(473 kg)*	None
	—Cast Iron (each)	200 lb *(91 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 11L-15; 6; 28 *(195)*	Two 11L-15; 6; 28 *(195)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	75 lb *(34 kg)*	None
Height of drawbar		22 in *(560 mm)*	22 in *(560 mm)*
Static Weight with Operator--Rear		8060 lb *(3656 kg)*	5575 lb *(2529 kg)*
Front		3000 lb *(1361 kg)*	2850 lb *(1293 kg)*
Total		11060 lb *(5017 kg)*	8425 lb *(3822 kg)*

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 180°F *(82.3°C)*. Seven gears were chosen between 15% slip and 10 mph *(16.1 km/h)*. Upon removal of the upper radiator hose, the cooling system was found to be partially blocked by tape. During final inspection, a number of shallow scratches were found on the cylinder walls.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1382.**

LOUIS I. LEVITICUS
Engineer-in Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

Case 1490 Powershift DSL

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1383 — CASE 1690 MANUAL DIESEL 12 SPEED (WITH MECHANICAL FRONT WHEEL DRIVE)

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption			Temperature °F (°C)			Barometer inch Hg (kPa)
		gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—1123 rpm)								
90.39	2300	5.803	0.450	15.58	188	59	75	28.777
(67.40)		*(21.967)*	*(0.274)*	*(3.068)*	*(86.4)*	*(14.8)*	*(23.8)*	*(97.174)*
Standard Power take-off Speed (1000 rpm)—One Hour								
87.76	2048	5.500	0.439	15.95	194	60	75	28.815
(65.44)		*(20.820)*	*(0.267)*	*(3.143)*	*(90.2)*	*(15.5)*	*(24.1)*	*(97.304)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
78.07	2340	4.829	0.434	16.16	182	60	75	......
(58.22)		*(18.280)*	*(0.264)*	*(3.185)*	*(83.1)*	*(15.6)*	*(23.6)*	......
0.00	2448	1.336	.....	.....	177	60	75	......
(0.00)		*(5.057)*	.....	.....	*(80.6)*	*(15.6)*	*(23.9)*	......
39.99	2390	2.847	0.499	14.05	179	60	75	......
(29.82)		*(10.777)*	*(0.303)*	*(2.767)*	*(81.7)*	*(15.6)*	*(23.9)*	......
91.22	2300	5.900	0.453	15.46	187	60	75	......
(68.02)		*(22.334)*	*(0.276)*	*(3.046)*	*(86.1)*	*(15.6)*	*(23.9)*	......
20.19	2413	2.059	0.715	9.81	178	60	75	......
(15.06)		*(7.794)*	*(0.435)*	*(1.932)*	*(81.1)*	*(15.6)*	*(23.9)*	......
59.18	2368	3.725	0.441	15.89	180	60	74	......
(44.13)		*(14.101)*	*(0.268)*	*(3.130)*	*(82.2)*	*(15.3)*	*(23.3)*	......
Av 48.11	**2377**	**3.449**	**0.502**	**13.95**	**180**	**60**	**75**	**28.853**
Av (35.88)		***(13.056)***	***(0.306)***	***(2.748)***	***(82.4)***	***(15.5)***	***(23.8)***	***(97.433)***

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F (°C)			Barom. inch Hg (kPa)
					gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 7th (3-2) Gear											
72.55	6302	4.32	2299	6.39	5.495	0.531	13.20	198	59	66	28.775
(54.10)	*(28.03)*	*(6.95)*			*(20.801)*	*(0.323)*	*(2.600)*	*(92.2)*	*(15.0)*	*(18.9)*	*(97.170)*
75% of Pull at Maximum Power—Ten Hours 7th (3-2) Gear											
61.80	5145	4.50	2368	5.01	4.578	0.519	13.50	194	45	56	29.400
(46.09)	*(22.89)*	*(7.25)*			*(17.328)*	*(0.316)*	*(2.660)*	*(90.2)*	*(7.3)*	*(13.4)*	*(99.270)*
50% of Pull at Maximum Power—Two Hours 7th (3-2) Gear											
42.73	3430	4.67	2405	2.93	3.479	0.570	12.28	182	50	52	28.975
(31.86)	*(15.26)*	*(7.52)*			*(13.169)*	*(0.347)*	*(2.419)*	*(83.3)*	*(10.0)*	*(11.1)*	*(97.840)*
50% of Pull at Reduced Engine Speed—Two Hours 10th (3-3) Gear											
42.57	3419	4.67	1392	2.89	2.926	0.481	14.55	183	52	54	28.935
(31.75)	*(15.21)*	*(7.51)*			*(11.076)*	*(0.293)*	*(2.866)*	*(83.9)*	*(11.1)*	*(12.2)*	*(97.710)*
MAXIMUM POWER IN SELECTED GEARS											
67.41	10536	2.40	2311	14.95	4th (3-1) Gear			187	54	56	28.810
(50.27)	*(46.87)*	*(3.86)*						*(86.1)*	*(12.2)*	*(13.3)*	*(97.290)*
69.76	9382	2.79	2298	11.11	5th (1-3) Gear			192	55	60	28.830
(52.02)	*(41.73)*	*(4.49)*						*(88.9)*	*(12.8)*	*(15.6)*	*(97.350)*
74.23	8503	3.27	2300	9.90	6th (2-2) Gear			206	43	55	29.530
(55.35)	*(37.82)*	*(5.27)*						*(96.7)*	*(6.1)*	*(12.8)*	*(99.720)*
78.08	6855	4.27	2299	7.18	7th (3-2) Gear			204	45	57	29.540
(58.22)	*(30.49)*	*(6.87)*						*(95.6)*	*(7.2)*	*(13.9)*	*(99.750)*
77.09	5457	5.30	2298	5.37	8th (4-1) Gear			202	43	53	29.570
(57.49)	*(24.27)*	*(8.53)*						*(94.4)*	*(6.1)*	*(11.7)*	*(99.850)*
76.13	4768	5.99	2300	4.51	9th (2-3) Gear			203	45	57	29.550
(56.77)	*(21.21)*	*(9.64)*						*(95.0)*	*(7.2)*	*(13.9)*	*(99.790)*
77.24	3775	7.67	2301	3.49	10th (3-3) Gear			206	43	55	29.530
(57.60)	*(16.79)*	*(12.35)*						*(96.7)*	*(6.1)*	*(12.8)*	*(99.720)*
75.21	3163	8.92	2300	2.89	11th (4-2) Gear			206	43	55	29.520
(56.08)	*(14.07)*	*(14.36)*						*(96.7)*	*(6.1)*	*(12.8)*	*(99.680)*

Department of Agricultural Engineering

Dates of Test: March 27-April 21, 1981

Manufacturer: J. I. CASE COMPANY, Racine, Wisconsin 53404

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8416 **Fuel weight** 7.007 lbs/gal *(0.840 kg/l)* **Oil SAE** 30 **API service classification** CD-SE **To motor** 3.552 gal *(13.446 l)* **Drained from motor** 2.638 gal *(9.986 l)* **Transmission lubricant** Case TFD fluid **Final drive lubricant** Case ETHB fluid **Front axle lubricant** Case FDL SAE 90 **Total time engine was operated** 53.0 hours.

ENGINE Make Case Diesel **Type** six cylinder vertical **Serial No.** 330001 11450442 **Crankshaft** lengthwise **Rated rpm** 2300 **Bore and stroke** 3.939" × 4.500" *(100 mm × 114.3 mm)* **Compression ratio** 16 to 1 **Displacement** 329 cu in *(5393 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two sets of two paper elements in parallel with centrifugal precleaner **Oil filter** one full flow cartridge **Fuel filter** two paper elements with sediment bowl and screen **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type front wheel assist **Serial No.** 1690/18/11210359 **Tread width** rear 60.75" *(1543 mm)* to 85" *(2159 mm)* front 59" *(1499 mm)* to 71" *(1803 mm)* **Wheel base** 100.5" *(2553 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 40.4" *(1026 mm)* Vertical distance above roadway 32.7" *(831 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.0 *(1.7)* second 1.7 *(2.8)* third 2.1 *(3.4)* fourth 2.7 *(4.3)* fifth 3.0 *(4.8)* sixth 3.5 *(5.6)* seventh 4.4 *(7.0)* eighth 5.3 *(8.6)* ninth 6.0 *(9.6)* tenth 7.6 *(12.1)* eleventh 8.7 *(14.1)* twelfth 15.1 *(24.3)* reverse 1.8 *(2.8)*, 3.5 *(5.7)*, 4.5 *(7.2)*, 8.9 *(14.3)* **Clutch** single dry disc hydraulically operated by foot pedal **Brakes** multiple wet disc hydraulically operated by two foot pedals which can be locked together and hand lever **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 166" *(4.22 m)* left 166" *(4.22 m)* (on concrete surface without brake) right 213" *(5.41 m)* left 213" *(5.41 m)* **Turning space diameter** (on concrete surface with brake applied) right 347" *(8.81 m)* left 347" *(8.81 m)* (on concrete surface without brake) right 441" *(11.20 m)* left 441" *(11.20 m)* **Power take-off** 1000 rpm at 2048 engine rpm and 540 rpm at 2077 engine rpm.

LUGGING ABILITY IN 7th (3-2) GEAR

Crankshaft Speed rpm	2299	2076	1840	1609	1375	1150
Pull—lbs *(kN)*	6855 *(30.49)*	7596 *(33.79)*	7989 *(35.54)*	8311 *(36.97)*	8390 *(37.32)*	8250 *(36.70)*
Increase in Pull %	0	11	17	21	22	20
Power—Hp *(kW)*	78.08 *(58.22)*	77.24 *(57.60)*	71.49 *(53.31)*	64.68 *(48.23)*	55.70 *(41.54)*	45.86 *(34.20)*
Speed—Mph *(km/h)*	4.27 *(6.87)*	3.81 *(6.13)*	3.36 *(5.41)*	2.92 *(4.70)*	2.49 *(4.01)*	2.08 *(3.35)*
Slip %	7.18	8.13	8.93	9.45	9.58	9.45

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	97.0	96.5
75% of Pull at Maximum Power—Ten Hours	99.5	
50% of Pull at Maximum Power—Two Hours	95.0	
50% of Pull at Reduced Engine Speed—Two Hours	90.5	
Bystander in 12th (4-3) gear		88.0

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	Fuel Consumption lb/hp.hr *(kg/kW.h)*	Fuel Consumption Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cooling med	Temp. °F *(°C)* Air wet bulb	Temp. °F *(°C)* Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 7th (3-2) Gear											
70.30 *(52.42)*	6344 *(28.22)*	4.16 *(6.69)*	2299	8.63	5.477 *(20.733)*	0.546 *(0.332)*	12.84 *(2.529)*	201 *(93.9)*	55 *(12.8)*	72 *(22.2)*	28.900 *(97.570)*
MAXIMUM POWER IN SELECTED GEARS											
63.06 *(47.02)*	8785 *(39.08)*	2.69 *(4.33)*	2336	14.68	5th (1-3) Gear			195 *(90.6)*	55 *(12.8)*	66 *(18.9)*	28.860 *(97.460)*
76.29 *(56.89)*	6944 *(30.89)*	4.12 *(6.63)*	2300	9.35	7th (3-2) Gear			203 *(95.0)*	45 *(7.2)*	57 *(13.9)*	29.530 *(99.720)*
76.75 *(57.23)*	5602 *(24.92)*	5.14 *(8.27)*	2300	7.10	8th (4-1) Gear			201 *(93.9)*	44 *(6.7)*	56 *(13.3)*	29.560 *(99.820)*

TIRES, BALLAST AND WEIGHT		**With Ballast**	**Without Ballast**
Rear Tires	—No., size, ply & psi *(kPa)*	Two 18.4-34; 6; 16 *(110)*	Two 18.4-34; 6; 16 *(110)*
Ballast	—Liquid (each)	1190 lb *(540 kg)*	None
	—Cast Iron (each)	642 lb *(291 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 13.6-24; 6; 18 *(125)*	Two 13.6-24; 6; 18 *(125)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	25 lb *(11 kg)*	None
Height of drawbar		20.5 in *(520 mm)*	20.5 in *(520 mm)*
Static Weight with Operator	—Rear	8915 lb *(4044 kg)*	5250 lb *(2381 kg)*
	Front	3555 lb *(1612 kg)*	3505 lb *(1590 kg)*
	Total	12470 lb *(5656 kg)*	8755 lb *(3971 kg)*

REPAIRS and ADJUSTMENTS: During preliminary PTO tests, two injectors were replaced and all injectors were readjusted for proper pressure. The fuel transfer pump was replaced during preliminary drawbar tests. New injectors were installed after the 10 hour test.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 155°F *(68.3°C)*. Eight gears were chosen between 15% slip and 10 mph *(16.1 km/h)*. The performance figures on this report apply to those models equipped with mechanical front wheel drive. The exhaust valves of No. 1 and No. 6 cylinders were pitted.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1383.**

LOUIS I. LEVITICUS
Engineer-in Charge

K. VON BARGEN
W. E. SPLINTER
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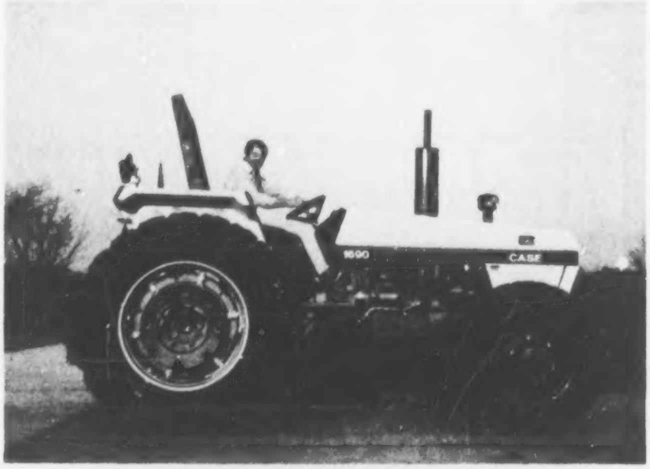


Case 1690 Manual Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1385 — HESSTON 480-8 DT FIAT DIESEL ALSO HESSTON 480-8 FIAT DIESEL 12 SPEED — ALSO 8 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption			Temperature °F *(°C)*			
		gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—650 rpm)								
42.58 *(31.75)*	2600	2.720 *(10.296)*	0.447 *(0.272)*	15.65 *(3.084)*	170 *(76.7)*	66 *(18.8)*	75 *(23.9)*	28.900 *(97.591)*
Standard Power take-off Speed (540 rpm)—One Hour								
40.36 *(30.10)*	2160	2.384 *(9.024)*	0.414 *(0.252)*	16.93 *(3.336)*	170 *(76.4)*	66 *(18.8)*	75 *(23.9)*	28.795 *(97.236)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
37.71 *(28.12)*	2708	2.524 *(9.554)*	0.469 *(0.285)*	14.94 *(2.943)*	169 *(75.8)*	66 *(18.6)*	76 *(24.2)*	....
0.00 *(0.00)*	2798	0.934 *(3.536)*	....	....	164 *(73.3)*	66 *(18.9)*	76 *(24.2)*	....
19.21 *(14.32)*	2758	1.693 *(6.409)*	0.617 *(0.375)*	11.35 *(2.234)*	168 *(75.6)*	66 *(18.9)*	76 *(24.4)*	....
42.73 *(31.86)*	2600	2.717 *(10.285)*	0.445 *(0.271)*	15.73 *(3.098)*	172 *(77.8)*	67 *(19.4)*	77 *(25.0)*	....
9.70 *(7.23)*	2782	1.277 *(4.834)*	0.922 *(0.561)*	7.59 *(1.496)*	165 *(73.9)*	67 *(19.2)*	77 *(24.7)*	....
28.48 *(21.24)*	2728	2.087 *(7.900)*	0.513 *(0.312)*	13.65 *(2.689)*	169 *(76.1)*	67 *(19.4)*	77 *(24.7)*	....
Av 22.97 ***Av (17.13)***	**2729**	**1.872** ***(7.086)***	**0.571** ***(0.347)***	**12.27** ***(2.417)***	**168** ***(75.4)***	**66** ***(19.1)***	**76** ***(24.6)***	**28.823** ***(97.332)***

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F *(°C)*			
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 9th (H1) Gear											
35.98 *(26.83)*	2662 *(11.84)*	5.07 *(8.16)*	2599	6.29	2.696 *(10.206)*	0.525 *(0.319)*	13.34 *(2.628)*	178 *(81.1)*	57 *(13.9)*	65 *(18.3)*	28.855 *(97.440)*
75% of Pull at Maximum Power—Ten Hours 9th (H1) Gear											
29.52 *(22.01)*	2062 *(9.17)*	5.37 *(8.64)*	2703	4.55	2.353 *(8.908)*	0.558 *(0.340)*	12.54 *(2.470)*	178 *(81.1)*	60 *(15.7)*	73 *(22.9)*	28.780 *(97.186)*
50% of Pull at Maximum Power—Two Hours 9th (H1) Gear											
20.14 *(15.02)*	1374 *(6.11)*	5.50 *(8.85)*	2742	3.65	1.893 *(7.164)*	0.658 *(0.400)*	10.64 *(2.096)*	176 *(80.0)*	54 *(11.9)*	64 *(17.5)*	28.975 *(97.844)*
50% of Pull at Reduced Engine Speed—Two Hours 10th (H2) Gear											
20.34 *(15.17)*	1386 *(6.17)*	5.50 *(8.86)*	1821	3.38	1.482 *(5.610)*	0.510 *(0.310)*	13.73 *(2.704)*	175 *(79.2)*	56 *(13.1)*	69 *(20.6)*	28.975 *(97.844)*
MAXIMUM POWER IN SELECTED GEARS											
28.22 *(21.05)*	5265 *(23.42)*	2.01 *(3.24)*	2718	14.93	6th (L2) Gear			175 *(79.2)*	47 *(8.3)*	53 *(11.7)*	28.950 *(97.760)*
35.22 *(26.26)*	4528 *(20.14)*	2.92 *(4.69)*	2600	12.01	7th (L3) Gear			179 *(81.7)*	54 *(12.2)*	59 *(15.0)*	28.880 *(97.520)*
36.07 *(26.90)*	3444 *(15.32)*	3.93 *(6.32)*	2600	8.22	8th (L4) Gear			178 *(81.1)*	54 *(12.2)*	58 *(14.4)*	28.870 *(97.490)*
37.07 *(27.65)*	2740 *(12.19)*	5.07 *(8.17)*	2599	6.15	9th (H1) Gear			178 *(81.1)*	53 *(11.7)*	57 *(13.9)*	28.870 *(97.490)*
36.15 *(26.95)*	1736 *(7.72)*	7.81 *(12.57)*	2598	3.98	10th (H2) Gear			178 *(80.8)*	54 *(12.2)*	60 *(15.6)*	28.860 *(97.460)*

LUGGING ABILITY IN 9th (H1) GEAR

Crankshaft Speed rpm	2599	2345	2078	1816	1560	1294
Pull—lbs *(kN)*	2740 *(12.19)*	3023 *(13.45)*	3182 *(14.15)*	3315 *(14.75)*	3375 *(15.01)*	3340 *(14.86)*
Increase in Pull %	0	10	16	21	23	22
Power—Hp *(kW)*	37.07 *(27.65)*	36.55 *(27.26)*	33.93 *(25.30)*	30.81 *(22.98)*	26.88 *(20.04)*	22.09 *(16.47)*
Speed—Mph *(km/h)*	5.07 *(8.17)*	4.53 *(7.30)*	4.00 *(6.44)*	3.49 *(5.61)*	2.99 *(4.81)*	2.48 *(3.99)*
Slip %	6.15	7.00	7.45	7.78	8.00	7.89

Department of Agricultural Engineering

Dates of Test: April 21-May 1, 1981

Manufacturer: FIAT TRATTORI S.p.A., Via Pico della Mirandola, 72-41100, Modena, Italy

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8408 **Fuel weight** 7.001 lbs/gal *(0.839 kg/l)* **Oil SAE** 15W-40 **API service classification** SB/SE-CA/CD **To motor** 1.888 gal *(7.146 l)* **Drained from motor** 1.465 gal *(5.546 l)* **Transmission lubricant** SAE 15W-40 **Final drive lubricant** API 303 **Total time engine was operated** 39.5 hours

ENGINE Make U.T.B. Diesel **Type** three cylinder vertical **Serial No.** 8035.02309*002759* **Crankshaft** lengthwise **Rated rpm** 2600 **Bore and stroke** 3.937" × 4.33" *(100 mm × 110 mm)* **Compression ratio** 17 to 1 **Displacement** 158 cu in *(2592 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** oil bath with centrifugal precleaner **Oil filter** one full flow paper cartridge **Fuel filter** two paper elements **Muffler** horizontal **Cooling medium temperature control** one thermostat.

CHASSIS: Type front wheel assist **Serial No.** 480/8DT*973359* **Tread width** rear 51.2" *(1300 mm)* to 74.8" *(1900 mm)* front 55.1" *(1400 mm)* to 59.1" *(1500 mm)* **Wheel base** 78.7" *(2000 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 32.2" *(818 mm)* Vertical distance above roadway 31.3" *(794 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 0.5 *(0.8)* second 0.7 *(1.1)* third 1.0 *(1.7)* fourth 1.3 *(2.2)* fifth 1.5 *(2.4)* sixth 2.2 *(3.5)* seventh 3.2 *(5.2)* eighth 4.2 *(6.7)* ninth 5.2 *(8.4)* tenth 7.9 *(12.7)* eleventh 11.6 *(18.6)* twelfth 14.9 *(24.0)* reverse 0.7 *(1.1)*, 2.1 *(3.4)*, 7.5 *(12.1)* **Clutch** single dry disc operated by foot pedal **Brakes** drum and shoe operated by two foot pedals which can be locked together and hand lever **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 168" *(4.27 m)* left 168" *(4.27 m)* (on concrete surface without brake) right 182" *(4.62 m)* left 184" *(4.67 m)* **Turning space diameter** (on concrete surface with brake applied) right 343" *(8.72 m)* left 344" *(8.74 m)* (on concrete surface without brake) right 372" *(9.44 m)* left 376" *(9.54 m)* **Power take-off** 540 rpm at 2160 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 141°F *(60.7°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	98.5	98.0
75% of Pull at Maximum Power—Ten Hours		96.5
50% of Pull at Maximum Power—Two Hours		96.0
50% of Pull at Reduced Engine Speed—Two Hours		92.0
Bystander in 12th (H4) gear		86.5

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	Fuel Consumption lb/hp.hr *(kg/kW.h)*	Fuel Consumption Hp.hr/gal *(kW.h/l)*	Temp. °F (°C) Cooling med	Temp. °F (°C) Air wet bulb	Temp. °F (°C) Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 9th (H1) Gear											
36.33 *(27.09)*	2613 *(11.62)*	5.21 *(8.39)*	2599	4.29	2.732 *(10.341)*	0.526 *(0.320)*	13.30 *(2.620)*	179 *(81.7)*	60 *(15.6)*	71 *(21.7)*	28.820 *(97.320)*
MAXIMUM POWER IN SELECTED GEARS											
33.60 *(25.06)*	6308 *(28.06)*	2.00 *(3.22)*	2677	14.80	6th (L2) Gear			177 *(80.3)*	51 *(10.6)*	58 *(14.4)*	28.960 *(97.790)*
37.53 *(27.99)*	2698 *(12.00)*	5.22 *(8.39)*	2601	4.32	9th (H1) Gear			178 *(80.8)*	54 *(12.2)*	59 *(15.0)*	28.880 *(97.520)*

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 14.9-28; 6; 16 *(110)*	Two 14.9-28; 6; 16 *(110)*
Ballast	—Liquid (each)	442 lb *(201 kg)*	None
	—Cast Iron (each)	600 lb *(272 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 8.3-24; 8; 22 *(150)*	Two 8.3-24; 8; 22 *(150)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	200 lb *(91 kg)*	None
Height of drawbar		18.5 in *(470 mm)*	18.5 in *(470 mm)*
Static Weight with Operator	—Rear	5230 lb *(2372 kg)*	3145 lb *(1426 kg)*
	Front	2575 lb *(1168 kg)*	2175 lb *(987 kg)*
	Total	7805 lb *(3540 kg)*	5320 lb *(2413 kg)*

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1385.**

LOUIS I. LEVITICUS
Engineer-in Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

HESSTON 480 8 DT
1385

Hesston 480-8 DT Fiat Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1386 — HESSTON 780 DT FIAT DIESEL

ALSO HESSTON 780 FIAT DIESEL

8 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—606 rpm)								
70.57 *(52.62)*	2500	4.357 *(16.493)*	0.432 *(0.263)*	16.20 *(3.190)*	182 *(83.2)*	61 *(16.0)*	75 *(23.8)*	28.823 *(97.332)*
Standard Power take-off Speed (540 rpm)—One Hour								
66.67 *(49.72)*	2226	3.989 *(15.100)*	0.419 *(0.255)*	16.71 *(3.293)*	182 *(83.1)*	62 *(16.4)*	75 *(23.9)*	28.825 *(97.338)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
61.85 *(46.12)*	2576	3.745 *(14.176)*	0.424 *(0.258)*	16.52 *(3.253)*	173 *(78.3)*	62 *(16.7)*	75 *(23.9)*	....
0.00 *(0.00)*	2632	1.088 *(4.119)*	....	....	153 *(67.2)*	63 *(17.2)*	75 *(23.9)*	....
31.19 *(23.26)*	2598	2.314 *(8.759)*	0.520 *(0.316)*	13.48 *(2.656)*	162 *(71.9)*	63 *(17.2)*	75 *(23.9)*	....
70.83 *(52.82)*	2501	4.392 *(16.626)*	0.434 *(0.264)*	16.13 *(3.177)*	183 *(83.9)*	63 *(17.2)*	76 *(24.2)*	....
15.68 *(11.69)*	2614	1.645 *(6.227)*	0.735 *(0.447)*	9.53 *(1.877)*	155 *(68.3)*	63 *(17.2)*	75 *(23.9)*	....
46.32 *(34.54)*	2572	2.991 *(11.322)*	0.452 *(0.275)*	15.49 *(3.051)*	168 *(75.6)*	63 *(17.2)*	75 *(23.9)*	....
Av 37.65 ***Av (28.08)***	**2582**	**2.696** ***(10.205)***	**0.501** ***(0.305)***	**13.96** ***(2.752)***	**166** ***(74.2)***	**63** ***(17.1)***	**75** ***(23.9)***	**28.800** ***(97.258)***

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp °F *(°C)* Cooling med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 5th (H1) Gear											
59.79 *(44.58)*	4373 *(19.45)*	5.13 *(8.25)*	2501	7.85	4.357 *(16.491)*	0.510 *(0.310)*	13.72 *(2.703)*	187 *(85.8)*	53 *(11.7)*	70 *(20.8)*	28.845 *(97.410)*
75% of Pull at Maximum Power—Ten Hours 5th (H1) Gear											
48.72 *(36.33)*	3383 *(15.05)*	5.40 *(8.69)*	2569	5.68	3.514 *(13.301)*	0.505 *(0.307)*	13.86 *(2.731)*	180 *(82.3)*	64 *(17.8)*	81 *(27.2)*	28.604 *(96.590)*
50% of Pull at Maximum Power—Two Hours 5th (H1) Gear											
33.50 *(24.98)*	2256 *(10.04)*	5.57 *(8.96)*	2608	4.15	2.732 *(10.341)*	0.571 *(0.347)*	12.26 *(2.416)*	166 *(74.4)*	67 *(19.2)*	74 *(23.1)*	28.695 *(96.900)*
50% of Pull at Reduced Engine Speed—Two Hours 6th (H2) Gear											
33.69 *(25.12)*	2268 *(10.09)*	5.57 *(8.97)*	1808	3.98	2.285 *(8.651)*	0.475 *(0.289)*	14.74 *(2.904)*	170 *(76.4)*	71 *(21.4)*	81 *(27.2)*	28.685 *(96.860)*
MAXIMUM POWER IN SELECTED GEARS											
53.36 *(39.79)*	6965 *(30.98)*	2.87 *(4.62)*	2543	14.99	3rd (L3) Gear			158 *(69.7)*	64 *(17.8)*	68 *(20.0)*	28.700 *(96.920)*
59.07 *(44.05)*	5806 *(25.83)*	3.82 *(6.14)*	2500	11.39	4th (L4) Gear			181 *(82.5)*	51 *(10.6)*	63 *(17.2)*	28.880 *(97.520)*
61.59 *(45.93)*	4507 *(20.05)*	5.13 *(8.26)*	2500	7.91	5th (H1) Gear			175 *(79.4)*	48 *(8.9)*	59 *(15.0)*	28.900 *(97.590)*
62.06 *(46.28)*	3058 *(13.60)*	7.61 *(12.25)*	2499	5.24	6th (H2) Gear			184 *(84.2)*	51 *(10.6)*	65 *(18.3)*	28.870 *(97.490)*

LUGGING ABILITY IN 5th (H1) GEAR

Crankshaft Speed rpm	2500	2253	2000	1746	1494	1246	1004
Pull—lbs *(kN)*	4507 *(20.05)*	4771 *(21.22)*	4947 *(22.00)*	5107 *(22.72)*	5159 *(22.95)*	5222 *(23.23)*	5218 *(23.21)*
Increase in Pull %	0	6	10	13	14	16	16
Power—Hp *(kW)*	61.59 *(45.93)*	58.38 *(43.54)*	53.44 *(39.85)*	47.98 *(35.78)*	41.39 *(30.86)*	34.88 *(26.01)*	27.97 *(20.86)*
Speed—Mph *(km/h)*	5.13 *(8.26)*	4.59 *(7.39)*	4.05 *(6.52)*	3.52 *(5.67)*	3.01 *(4.84)*	2.50 *(4.03)*	2.01 *(3.24)*
Slip %	7.91	8.60	8.98	9.47	9.59	9.83	9.96

Department of Agricultural Engineering

Dates of Test: April 21-29, 1981

Manufacturer: FIAT TRATTORI S.p.A., Via Pico della Mirandola, 72-41100, Modena, Italy

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8408 **Fuel weight** 7.001 lbs/gal *(0.839 kg/l)* **Oil SAE** 15W-40 **API service classification** SB/SE-CA/CD **To motor** 2.684 gal *(10.160 l)* **Drained from motor** 2.287 gal *(8.657 l)* **Transmission lubricant** SAE 15W-40 **Final drive lubricant** API 303 **Total time engine was operated** 40.0 hours

ENGINE Make Fiat Diesel **Type** four cylinder vertical **Serial No.** 8045.04*377-799018 **Crankshaft** lengthwise **Rated rpm** 2500 **Bore and stroke** 4.055" × 4.33" *(103 mm × 110 mm)* **Compression ratio** 17 to 1 **Displacement** 224 cu in *(3666 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements **Oil filter** one full flow paper cartridge **Fuel filter** two paper elements **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type front wheel assist **Serial No.** 780DT/8*682310* **Tread width** rear 55.1" *(1400 mm)* to 82.7" *(2100 mm)* front 64.2" *(1630 mm)* to 77.0" *(1955 mm)* **Wheel base** 89.8" *(2280 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 33.8" *(859 mm)* Vertical distance above roadway 31.3" *(795 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.5 *(2.4)* second 2.2 *(3.6)* third 3.3 *(5.3)* fourth 4.2 *(6.8)* fifth 5.5 *(8.9)* sixth 7.9 *(12.8)* seventh 11.8 *(19.1)* eighth 15.3 *(24.7)* reverse 2.0 *(3.2)*, 7.1 *(11.5)* **Clutch** dry double disc operated by foot pedal **Brakes** single wet disc hydraulically operated by two foot pedals which can be locked together and hand lever **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 191" *(4.85 m)* left 189" *(4.80 m)* (on concrete surface without brake) right 214" *(5.44 m)* left 213" *(5.41 m)* **Turning space diameter** (on concrete surface with brake applied) right 393" *(9.98 m)* left 389" *(9.88 m)* (on concrete surface without brake) right 438" *(11.13 m)* left 436" *(11.07 m)* **Power take-off** 540 rpm at 2226 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 139°F *(59.5°C)*. Four gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	97.0	97.5
75% of Pull at Maximum Power—Ten Hours		96.0
50% of Pull at Maximum Power—Two Hours		94.0
50% of Pull at Reduced Engine Speed—Two Hours		91.0
Bystander in 8th (H4) gear		89.5

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F *(°C)*			Barom. inch Hg *(kPa)*
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 5th (H1) Gear											
59.97 *(44.72)*	4275 *(19.02)*	5.26 *(8.47)*	2499	6.00	4.357 *(16.491)*	0.509 *(0.309)*	13.77 *(2.712)*	190 *(87.8)*	56 *(13.1)*	74 *(23.1)*	28.805 *(97.270)*
MAXIMUM POWER IN SELECTED GEARS											
43.15 *(32.18)*	8210 *(36.52)*	1.97 *(3.17)*	2583	14.87	2nd (L2) Gear			151 *(65.8)*	62 *(16.7)*	67 *(19.4)*	28.690 *(96.880)*
61.95 *(46.20)*	4420 *(19.66)*	5.26 *(8.46)*	2500	6.16	5th (H1) Gear			179 *(81.7)*	50 *(10.0)*	62 *(16.7)*	28.890 *(97.560)*

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 18.4-30; 6; 16 *(110)*	Two 18.4-30; 6; 16 *(110)*
Ballast	—Liquid (each)	950 lb *(431 kg)*	None
	—Cast Iron (each)	710 lb *(322 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 12.4-24; 6, 22 *(150)*	Two 12.4-24; 6; 22 *(150)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	300 lb *(136 kg)*	None
Height of drawbar		19.5 in *(495 mm)*	19.5 in *(495 mm)*
Static Weight with Operator	—Rear	7175 lb *(3255 kg)*	3855 lb *(1749 kg)*
	Front	2925 lb *(1327 kg)*	2325 lb *(1054 kg)*
	Total	10100 lb *(4581 kg)*	6180 lb *(2803 kg)*

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. 1386.

LOUIS I. LEVITICUS
Engineer-in Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

HESSTON 780 DT

Hesston 780 DT Fiat Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1387 — INTERNATIONAL 284 DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temperature °F (°C) Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg (kPa)
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—650 rpm)								
27.47 (20.48)	2600	1.963 (7.431)	0.500 (0.304)	14.00 (2.756)	177 (80.7)	62 (16.6)	75 (23.9)	29.090 (98.233)
Standard Power take-off Speed (540 rpm)—One Hour								
23.92 (17.84)	2160	1.661 (6.288)	0.486 (0.296)	14.40 (2.837)	178 (80.9)	62 (16.7)	75 (24.1)	29.075 (98.182)
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
23.53 (17.55)	2622	1.744 (6.602)	0.519 (0.316)	13.49 (2.658)	171 (77.2)	62 (16.7)	76 (24.2)	....
0.00 (0.00)	2719	0.724 (2.741)	....	....	154 (67.8)	62 (16.7)	76 (24.4)	....
12.03 (8.97)	2676	1.183 (4.478)	0.688 (0.419)	10.17 (2.003)	160 (70.8)	61 (16.1)	75 (23.6)	....
28.16 (21.00)	2599	1.997 (7.559)	0.497 (0.302)	14.10 (2.778)	182 (83.1)	62 (16.4)	75 (23.9)	....
6.04 (4.50)	2695	0.934 (3.536)	1.082 (0.658)	6.47 (1.273)	155 (68.3)	62 (16.4)	75 (23.6)	....
17.95 (13.39)	2666	1.457 (5.515)	0.568 (0.346)	12.32 (2.428)	161 (71.7)	61 (16.1)	75 (23.6)	....
Av 14.62 Av (10.90)	**2663**	**1.340 (5.072)**	**0.642 (0.390)**	**10.91 (2.149)**	**164 (73.2)**	**62 (16.4)**	**75 (23.9)**	**29.047 (98.086)**

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temp. °F (°C) Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg (kPa)
Maximum Available Power—Two Hours 7th (H-3) Gear											
21.98 (16.39)	1448 (6.44)	5.69 (9.16)	2596	8.35	2.000 (7.570)	0.637 (0.387)	10.99 (2.165)	171 (77.2)	48 (8.6)	57 (13.6)	28.985 (97.880)
75% of Pull at Maximum Power—Ten Hours 7th (H-3) Gear											
18.32 (13.66)	1163 (5.17)	5.91 (9.51)	2636	6.32	1.739 (6.583)	0.665 (0.404)	10.53 (2.075)	170 (76.1)	55 (12.9)	62 (16.7)	28.740 (97.050)
50% of Pull at Maximum Power—Two Hours 7th (H-3) Gear											
12.78 (9.53)	785 (3.49)	6.11 (9.83)	2673	4.50	1.393 (5.272)	0.763 (0.464)	9.18 (1.808)	167 (75.0)	50 (9.7)	58 (14.4)	28.930 (97.690)
50% of Pull at Reduced Engine Speed—Two Hours 8th (H-4) Gear											
12.73 (9.49)	780 (3.47)	6.12 (9.85)	1799	4.43	1.125 (4.258)	0.619 (0.376)	11.32 (2.229)	166 (74.4)	50 (10.0)	57 (13.9)	28.910 (97.620)
MAXIMUM POWER IN SELECTED GEARS											
20.05 (14.95)	2523 (11.22)	2.98 (4.80)	2633	14.91	5th (H-1) Gear			169 (75.8)	45 (7.2)	56 (13.3)	28.960 (97.790)
22.73 (16.95)	2181 (9.70)	3.91 (6.29)	2597	12.59	6th (H-2) Gear			170 (76.4)	45 (7.2)	52 (11.1)	29.020 (98.000)
23.52 (17.54)	1545 (6.87)	5.71 (9.19)	2602	8.30	7th (H-3) Gear			169 (75.8)	44 (6.7)	50 (10.0)	29.030 (98.030)
22.84 (17.03)	978 (4.35)	8.76 (14.09)	2599	5.31	8th (H-4) Gear			170 (76.7)	46 (7.8)	53 (11.7)	29.020 (98.000)

LUGGING ABILITY IN 7th (H-3) GEAR

Crankshaft Speed rpm	2602	2349	2081	1824	1559	1300
Pull—lbs (kN)	1545 (6.87)	1636 (7.28)	1690 (7.52)	1701 (7.57)	1698 (7.55)	1641 (7.30)
Increase in Pull %	0	6	9	10	10	6
Power—Hp (kW)	23.52 (17.54)	22.35 (16.66)	20.40 (15.21)	17.99 (13.41)	15.34 (11.44)	12.40 (9.25)
Speed—Mph (km/h)	5.71 (9.19)	5.12 (8.24)	4.53 (7.28)	3.97 (6.38)	3.39 (5.45)	2.83 (4.56)
Slip %	8.30	8.88	9.05	9.32	9.23	8.88

Department of Agricultural Engineering

Dates of Test: April 30 to May 12, 1981

Manufacturer: INTERNATIONAL HARVESTER CO., 401 North Michigan Avenue, Chicago, Illinois 60611

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8408 **Fuel weight** 7.001 lbs/gal *(0.839 kg/l)* **Oil SAE** 30 **API service classification** CA/CD-SC/SE **To motor** 0.994 gal *(3.763 l)* **Drained from motor** 0.890 gal *(3.369 l)* **Transmission and final drive lubricant** I.H. Hytran fluid **Total time engine was operated** 46.0 hours

ENGINE Make Nissan Diesel **Type** three cylinder vertical **Serial No.** SD 16-003704 **Crankshaft** lengthwise **Rated rpm** 2600 **Bore and stroke** 3.27" × 3.94" *(83 mm × 100 mm)* **Compression ratio** 20.8 to 1 **Displacement** 99 cu in *(1622 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** one paper element **Oil filter** one full flow paper cartridge **Fuel filter** one paper element **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type standard **Serial No.** 2020002J001906* **Tread width** rear 41.5" *(1055 mm)* to 57.9" *(1470 mm)* front 39.4" *(1000 mm)* to 61.8" *(1570 mm)* **Wheel base** 63.0" *(1600 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 22.8" *(579 mm)* Vertical distance above roadway 26.0" *(660 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.0 *(1.6)* second 1.3 *(2.0)* third 1.8 *(2.8)* fourth 2.6 *(4.2)* fifth 3.5 *(5.6)* sixth 4.5 *(7.2)* seventh 6.2 *(10.0)* eighth 9.3 *(14.9)* reverse 1.8 *(2.8)*, 6.2 *(10.0)* **Clutch** single dry disc operated by foot pedal **Brakes** single wet disc hydraulically operated by two foot pedals which can be locked together **Steering** power assist **Turning radius** (on concrete surface with brake applied) right 98.4" *(2.50 m)* left 98.4" *(2.50 m)* (on concrete surface without brake) right 113.1" *(2.87 m)* left 113.1" *(2.87 m)* **Turning space diameter** (on concrete surface with brake applied) right 202.3" *(5.14 m)* left 202.3" *(5.14 m)* (on concrete surface without brake) right 231.7" *(5.88 m)* left 231.7" *(5.88 m)* **Power take-off** 540 rpm at 2160 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	94.5
75% of Pull at Maximum Power—Ten Hours	92.0
50% of Pull at Maximum Power—Two Hours	91.5
50% of Pull at Reduced Engine Speed—Two Hours	88.5
Bystander in 8th (H-4) gear	80.0

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 11.2/10-24; 4; 14 *(95)*	Two 11.2/10-24; 4; 14 *(95)*
Ballast	—Liquid (each)	295 lb *(134 kg)*	None
	—Cast Iron (each)	98 lb *(44 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 5.00-15; 4; 40 *(275)*	Two 5.00-15; 4; 40 *(275)*
Ballast	—Liquid (each)	None	None
	—Test Equip. (each)	37 lb *(17 kg)*	None
Height of drawbar		15.5 in *(395 mm)*	15.5 in *(395 mm)*
Static Weight with Operator—Rear		2595 lb *(1177 kg)*	1810 lb *(821 kg)*
Front		1005 lb *(456 kg)*	930 lb *(422 kg)*
Total		3600 lb *(1633 kg)*	2740 lb *(1243 kg)*

procedure. Temperature at injection pump return was 135°F *(57.3°C)*. Four gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1387.**

LOUIS I. LEVITICUS
Engineer-in Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

INTERNATIONAL

International 284 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1388 — INTERNATIONAL 786 DIESEL 16 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F (°C) Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—1158 rpm)								
80.20	2400	5.373	0.469	14.93	176	58	75	28.983
(59.81)		*(20.339)*	*(0.285)*	*(2.941)*	*(80.2)*	*(14.4)*	*(23.8)*	*(97.872)*
Standard Power take-off Speed (1000 rpm)—One Hour								
77.41	2072	4.923	0.445	15.72	177	58	75	28.960
(57.72)		*(18.636)*	*(0.271)*	*(3.097)*	*(80.6)*	*(14.7)*	*(23.9)*	*(97.794)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
71.92	2534	5.077	0.494	14.17	174	59	75	......
(53.63)		*(19.219)*	*(0.301)*	*(2.790)*	*(78.9)*	*(14.7)*	*(23.9)*	......
0.00	2652	2.099	.....	.....	169	59	74	......
(0.00)		*(7.946)*	.....	.....	*(76.1)*	*(14.7)*	*(23.3)*	......
36.80	2582	3.445	0.655	10.68	171	59	75	......
(27.44)		*(13.041)*	*(0.399)*	*(2.104)*	*(77.2)*	*(15.0)*	*(23.9)*	......
80.27	2401	5.386	0.470	14.90	176	59	75	......
(59.86)		*(20.388)*	*(0.286)*	*(2.936)*	*(79.7)*	*(15.0)*	*(23.9)*	......
18.64	2617	2.755	1.035	6.77	169	59	75	......
(13.90)		*(10.429)*	*(0.629)*	*(1.333)*	*(76.1)*	*(15.0)*	*(23.6)*	......
54.51	2564	4.237	0.544	12.86	172	59	75	......
(40.65)		*(16.039)*	*(0.331)*	*(2.534)*	*(77.8)*	*(15.0)*	*(23.9)*	......
Av 43.69	**2558**	**3.833**	**0.614**	**11.40**	**172**	**59**	**75**	**28.925**
Av (32.58)		***(14.509)***	***(0.374)***	***(2.246)***	***(77.7)***	***(14.9)***	***(23.8)***	***(97.675)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F (°C) Cooling med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 8th (1st Hi TA) Gear											
69.04	5463	4.74	2399	4.82	5.428	0.550	12.72	183	57	67	29.050
(51.49)	*(24.30)*	*(7.63)*			*(20.546)*	*(0.335)*	*(2.506)*	*(83.6)*	*(13.9)*	*(19.2)*	*(98.100)*
75% of Pull at Maximum Power—Ten Hours 8th (1st Hi TA) Gear											
56.15	4169	5.05	2523	3.58	4.728	0.590	11.88	181	56	60	28.770
(41.87)	*(18.54)*	*(8.13)*			*(17.897)*	*(0.359)*	*(2.340)*	*(82.7)*	*(13.4)*	*(15.6)*	*(97.150)*
50% of Pull at Maximum Power—Two Hours 8th (1st Hi TA) Gear											
38.22	2787	5.14	2540	2.50	3.821	0.700	10.00	179	50	54	29.120
(28.50)	*(12.40)*	*(8.28)*			*(14.464)*	*(0.426)*	*(1.970)*	*(81.7)*	*(9.7)*	*(11.9)*	*(98.330)*
50% of Pull at Reduced Engine Speed—Two Hours 12th (2nd Hi DD) Gear											
38.29	2788	5.15	1491	2.42	2.946	0.539	13.00	179	54	62	29.095
(28.56)	*(12.40)*	*(8.29)*			*(11.152)*	*(0.328)*	*(2.561)*	*(81.7)*	*(11.9)*	*(16.7)*	*(98.250)*
MAXIMUM POWER IN SELECTED GEARS											
57.78	9968	2.17	2514	14.59	4th (2nd Lo DD) Gear			181	54	62	29.080
(43.08)	*(44.34)*	*(3.50)*						*(82.5)*	*(12.2)*	*(16.7)*	*(98.200)*
67.44	8406	3.01	2401	8.64	5th (3rd Lo TA) Gear			182	54	69	28.990
(50.29)	*(37.39)*	*(4.84)*						*(83.1)*	*(12.2)*	*(20.6)*	*(97.890)*
68.40	6452	3.98	2400	5.85	6th (3rd Lo DD) Gear			182	54	69	28.990
(51.00)	*(28.70)*	*(6.40)*						*(83.3)*	*(12.2)*	*(20.6)*	*(97.890)*
68.60	6202	4.15	2400	5.64	7th (4th Lo TA) Gear			182	54	69	28.990
(51.15)	*(27.59)*	*(6.67)*						*(83.3)*	*(12.2)*	*(20.6)*	*(97.890)*
70.25	5556	4.74	2401	4.85	8th (1st Hi TA) Gear			183	53	68	29.010
(52.39)	*(24.72)*	*(7.63)*						*(83.9)*	*(11.7)*	*(20.0)*	*(97.960)*
68.93	4788	5.40	2400	4.06	9th (4th Lo DD) Gear			182	55	70	28.980
(51.40)	*(21.30)*	*(8.69)*						*(83.3)*	*(12.8)*	*(21.1)*	*(97.860)*
69.93	4259	6.16	2399	3.54	10th (1st Hi DD) Gear			182	55	70	28.980
(52.15)	*(18.95)*	*(9.91)*						*(83.3)*	*(12.8)*	*(21.1)*	*(97.860)*
70.15	4116	6.39	2398	3.47	11th (2nd Hi TA) Gear			183	55	70	28.980
(52.31)	*(18.31)*	*(10.29)*						*(83.6)*	*(12.8)*	*(21.1)*	*(97.860)*
68.66	3112	8.27	2399	2.57	12th (2nd Hi DD) Gear			183	55	70	28.970
(51.20)	*(13.84)*	*(13.31)*						*(83.9)*	*(12.8)*	*(21.1)*	*(97.830)*

Department of Agricultural Engineering

Dates of Test: April 30 to May 11, 1981

Manufacturer: INTERNATIONAL HARVESTER CO., 401 North Michigan Avenue, Chicago, Illinois 60611

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8408 **Fuel weight** 7.001 lbs/gal *(0.839 kg/l)* **Oil SAE** 30 **API service classification** CA/CD-SC/SE **To motor** 2.727 gal *(10.323 l)* **Drained from motor** 2.608 gal *(9.872 l)* **Transmission and final drive lubricant** I. H. Hytran fluid **Total time engine was operated** 41.5 hours

ENGINE Make International Diesel **Type** six cylinder vertical **Serial No.** 358DT2D095334* **Crankshaft** lengthwise **Rated rpm** 2400 **Bore and stroke** 3.875" × 5.0625" *(98.4 mm × 128.6 mm)* **Compression ratio** 14.8 to 1 **Displacement** 358 cu in *(5868 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements **Oil filter** one full flow cartridge **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil **Fuel filter** two paper cartridges **Muffler** underhood **Exhaust** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type standard with duals **Serial No.** 2470001U009083* **Tread width** rear 66" *(1676 mm)* to 113.5" *(2883 mm)* front 60" *(1520 mm)* to 84" *(2130 mm)* **Wheel base** 104.8" *(2662 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 29.8" *(757 mm)* Vertical distance above roadway 37.7" *(958 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with partial (2) range operator controlled powershift **Advertised speeds mph *(km/h)*** first 1.4 *(2.2)* second 1.8 *(2.8)* third 1.8 *(3.0)* fourth 2.4 *(3.8)* fifth 3.2 *(5.1)* sixth 4.1 *(6.6)* seventh 4.2 *(6.8)* eighth 4.8 *(7.8)* ninth 5.4 *(8.8)* tenth 6.2 *(10.0)* eleventh 6.4 *(10.3)* twelfth 8.2 *(13.2)* thirteenth 11.1 *(17.9)* fourteenth 14.3 *(23.0)* fifteenth 14.9 *(23.9)* sixteenth 19.1 *(30.7)* reverse 2.4 *(3.8)*, 3.0 *(4.9)*, 3.2 *(5.1)*, 4.0 *(6.5)*, 5.5 *(8.8)*, 7.0 *(11.3)*, 7.3 *(11.7)*, 9.4 *(15.1)* **Clutch** single dry disc operated by foot pedal with hydraulic power assist **Brakes** multiple wet disc hydraulically power actuated and operated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 142.8" *(3.63 m)* left 142.8" *(3.63 m)* (on concrete surface without brake) right 174.6" *(4.43 m)* left 174.6" *(4.43 m)* **Turning space diameter** (on concrete surface with brake applied) right 301.4" *(7.66 m)* left 301.4" *(7.66 m)* (on concrete surface without brake) right 365.2" *(9.28 m)*

LUGGING ABILITY IN 8th (1st Hi TA) GEAR

Crankshaft Speed rpm	2401	2163	1918	1677	1433	1202	965
Pull—lbs *(kN)*	5556 *(24.72)*	6150 *(27.36)*	6482 *(28.83)*	6767 *(30.10)*	7005 *(31.16)*	7072 *(31.46)*	6978 *(31.04)*
Increase in Pull %	0	11	17	22	26	27	26
Power—Hp *(kW)*	70.25 *(52.39)*	69.61 *(51.91)*	64.77 *(48.30)*	58.93 *(43.94)*	51.91 *(38.71)*	43.93 *(32.76)*	34.79 *(25.94)*
Speed—Mph *(km/h)*	4.74 *(7.63)*	4.24 *(6.83)*	3.75 *(6.03)*	3.27 *(5.26)*	2.78 *(4.47)*	2.33 *(3.75)*	1.87 *(3.01)*
Slip %	4.85	5.35	5.78	6.20	6.48	6.61	6.75

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	91.5
75% of Pull at Maximum Power—Ten Hours	92.5
50% of Pull at Maximum Power—Two Hours	93.0
50% of Pull at Reduced Engine Speed—Two Hours	91.0
Bystander in 15th (4 HiTA) gear	89.5

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Four 18.4-34; 6; 12 *(85)*	Four 18.4-34; 6; 12 *(85)*
Ballast	—Liquid (each)	None	None
	—Test Equip. (each)	61 lb *(28 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 11L-15; 6; 32 *(220)*	Two 11L-15; 6; 32 *(220)*
Ballast	—Liquid (each)	None	None
	—Test Equip. (each)	48 lb *(22 kg)*	None
Height of Drawbar		19.5 in *(495 mm)*	19.5 in *(495 mm)*
Static Weight with Operator	—Rear	8610 lb *(3905 kg)*	8365 lb *(3794 kg)*
	Front	3320 lb *(1506 kg)*	3225 lb *(1463 kg)*
	Total	11930 lb *(5411 kg)*	11590 lb *(5257 kg)*

left 365.2″ *(9.28 m)* **Power take-off** 1000 rpm at 2072 engine rpm and 540 rpm at 2106 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 132°F *(55.6°C)*. Nine gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1388.**

LOUIS I. LEVITICUS
Engineer-in Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

786
INTERNATIONAL

International 786 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1389 — MASSEY FERGUSON MF 2775 DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—1243 rpm)								
162.09	2600	11.054	0.478	14.66	185	61	75	28.893
(120.87)		*(41.844)*	*(0.291)*	*(2.889)*	*(85.2)*	*(16.1)*	*(23.9)*	*(97.568)*
Standard Power take-off Speed (1000 rpm)—One Hour								
146.87	2091	9.309	0.444	15.78	187	61	75	28.920
(109.52)		*(35.238)*	*(0.270)*	*(3.108)*	*(86.1)*	*(15.9)*	*(23.7)*	*(97.659)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
141.05	2664	10.039	0.499	14.05	183	61	75	......
(105.18)		*(38.002)*	*(0.303)*	*(2.768)*	*(83.9)*	*(16.1)*	*(23.9)*	......
0.00	2813	4.388	.....	.....	175	61	74	......
(0.00)		*(16.610)*	.....	.....	*(79.2)*	*(15.8)*	*(23.3)*	......
73.01	2752	7.033	0.675	10.38	180	61	75	......
(54.44)		*(26.623)*	*(0.411)*	*(2.045)*	*(81.9)*	*(15.8)*	*(23.6)*	......
163.37	2599	11.113	0.477	14.70	186	62	76	......
(121.82)		*(42.067)*	*(0.290)*	*(2.896)*	*(85.3)*	*(16.4)*	*(24.2)*	......
36.77	2784	5.655	1.078	6.50	176	62	75	......
(27.42)		*(21.407)*	*(0.656)*	*(1.281)*	*(80.0)*	*(16.4)*	*(23.6)*	......
107.73	2710	8.433	0.549	12.77	181	62	76	......
(80.33)		*(31.922)*	*(0.334)*	*(2.516)*	*(82.8)*	*(16.7)*	*(24.2)*	......
Av 86.99	**2720**	**7.777**	**0.627**	**11.19**	**180**	**61**	**75**	**28.943**
Av (64.87)		***(29.439)***	***(0.381)***	***(2.204)***	***(82.2)***	***(16.2)***	***(23.8)***	***(97.737)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 5th Gear											
136.54	8924	5.74	2599	5.19	10.970	0.563	12.45	188	66	77	28.800
(101.82)	*(39.69)*	*(9.23)*			*(41.524)*	*(0.342)*	*(2.452)*	*(86.7)*	*(18.9)*	*(25.0)*	*(97.250)*
75% of Pull at Maximum Power—Ten Hours 5th Gear											
110.42	6860	6.04	2694	3.71	9.457	0.600	11.68	184	64	74	28.842
(82.34)	*(30.51)*	*(9.71)*			*(35.799)*	*(0.365)*	*(2.300)*	*(84.6)*	*(17.5)*	*(23.4)*	*(97.400)*
50% of Pull at Maximum Power—Two Hours 5th Gear											
76.21	4568	6.26	2759	2.50	7.973	0.733	9.56	182	65	70	28.815
(56.83)	*(20.32)*	*(10.07)*			*(30.181)*	*(0.446)*	*(1.883)*	*(83.1)*	*(18.3)*	*(21.1)*	*(97.300)*
50% of Pull at Reduced Engine Speed—Two Hours 6th Gear											
76.47	4578	6.26	1992	2.66	6.279	0.575	12.18	183	67	72	28.805
(57.03)	*(20.36)*	*(10.08)*			*(23.767)*	*(0.350)*	*(2.399)*	*(83.6)*	*(19.2)*	*(22.2)*	*(97.270)*
MAXIMUM POWER IN SELECTED GEARS											
99.67	16766	2.23	2709	14.92	2nd Gear			183	64	67	28.820
(74.33)	*(74.58)*	*(3.59)*						*(83.9)*	*(17.8)*	*(19.4)*	*(97.320)*
132.00	15079	3.28	2600	10.96	3rd Gear			186	63	69	28.580
(98.43)	*(67.07)*	*(5.28)*						*(85.3)*	*(17.2)*	*(20.6)*	*(96.510)*
138.34	10565	4.91	2600	6.39	4th Gear			188	67	80	28.800
(103.16)	*(46.99)*	*(7.90)*						*(86.7)*	*(19.4)*	*(26.7)*	*(97.250)*
139.68	9139	5.73	2599	5.23	5th Gear			188	66	76	28.790
(104.16)	*(40.65)*	*(9.22)*						*(86.7)*	*(18.9)*	*(24.4)*	*(97.220)*
135.51	6272	8.10	2601	3.40	6th Gear			186	64	70	28.570
(101.05)	*(27.90)*	*(13.04)*						*(85.3)*	*(17.8)*	*(21.1)*	*(96.480)*

LUGGING ABILITY IN 5th GEAR

Crankshaft Speed rpm	2599	2340	2083	1818	1559	1293
Pull—lbs	9139	9802	10362	10611	10680	10626
(kN)	*(40.65)*	*(43.60)*	*(46.09)*	*(47.20)*	*(47.51)*	*(47.27)*
Increase in Pull %	0	7	13	16	17	16
Power—Hp	139.68	134.28	125.80	112.17	96.74	79.83
(kW)	*(104.16)*	*(100.13)*	*(93.81)*	*(83.65)*	*(72.14)*	*(59.53)*
Speed—Mph	5.73	5.14	4.55	3.96	3.40	2.82
(km/h)	*(9.22)*	*(8.27)*	*(7.33)*	*(6.38)*	*(5.47)*	*(4.53)*
Slip %	5.23	5.70	6.01	6.16	6.32	6.32

Department of Agricultural Engineering

Dates of Test: May 13-June 1, 1981

Manufacturer: MASSEY FERGUSON, INC.,
1901 Bell Avenue, Des Moines, Iowa 50315

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8417 **Fuel weight** 7.008 lbs/gal *(0.840 kg/l)* **Oil SAE** 20W-20 **API service classification** SE-SF, CC **To motor** 5.056 gal *(19.139 l)* **Drained from motor** 4.319 gal *(16.349 l)* **Transmission and final drive lubricant** M. F. Permatran Fluid **Total time engine was operated** 40.5 hours

ENGINE: Make Perkins Diesel **Type** eight cylinder vee **Serial No.** ZA31067U512373G **Crankshaft** lengthwise **Rated rpm** 2600 **Bore and stroke** 4.63" × 4.75" *(117.6 mm × 120.7 mm)* **Compression ratio** 16 to 1 **Displacement** 640 cu in *(10484 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with aspirator **Oil filter** two full flow spin on cartridges **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil **Fuel filter** two paper elements **Muffler** vertical **Cooling medium temperature control** 4 thermostats.

CHASSIS: Type standard with duals **Serial No.** 9R 010434 **Tread width** rear 71" *(1803 mm)* to 126" *(3200 mm)* front 60" *(1524 mm)* to 80" *(2032 mm)* **Wheel base** 110" *(2794 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 34.0" *(864 mm)* Vertical distance above roadway 40.6" *(1031 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.8 *(2.8)* second 2.5 *(4.0)* third 3.6 *(5.8)* fourth 5.0 *(8.0)* fifth 5.9 *(9.5)* sixth 8.2 *(13.2)* seventh 12.0 *(19.3)* eighth 17.1 *(27.5)* reverse 2.1 *(3.4)*, 2.9 *(4.7)*, 4.2 *(6.8)*, 6.0 *(9.6)*, 6.9 *(11.1)*, 9.6 *(15.5)*, **Clutch** dual dry disc operated by foot pedal **Brakes** single wet disc hydraulically power actuated and operated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 152" *(3.86 m)* left 152" *(3.86 m)* (on concrete surface without brake) right 202" *(5.13 m)* left 202" *(5.13 m)* **Turning space diameter** (on concrete surface with brake applied) right 330" *(8.38 m)* left 330" *(8.38 m)* (on concrete surface without brake) right 428" *(10.87 m)* left 428" *(10.87 m)* **Power take-off** 1000 rpm at 2091 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	102.0
75% of Pull at Maximum Power—Ten Hours	101.5
50% of Pull at Maximum Power—Two Hours	101.5
50% of Pull at Reduced Engine Speed—Two Hours	99.0
Bystander in 8th gear	96.0

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Four 20.8-38; 10; 14 *(95)*	Four 20.8-38; 10; 14 *(95)*
Ballast	—Liquid (each inner)	1143 lb *(518 kg)*	None
	—Cast Iron (each inner)	1000 lb *(454 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 14L-16.1; 6; 28 *(195)*	Two 14L-16.1; 6; 28 *(195)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	40 lb *(18 kg)*	None
Height of Drawbar		22 in *(560 mm)*	22 in *(560 mm)*
Static Weight with Operator	—Rear	15205 lb *(6897 kg)*	10920 lb *(4953 kg)*
	Front	4965 lb *(2252 kg)*	4885 lb *(2216 kg)*
	Total	20170 lb *(9149 kg)*	15805 lb *(7169 kg)*

procedure. Temperature at injection pump return was 164°F *(73.2°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1389.**

LOUIS I. LEVITICUS
Engineer-in Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

Massey Ferguson MF 2775 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1391 — MASSEY FERGUSON MF 4900 DIESEL 18 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F *(°C)* Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—1107 rpm)								
320.55 *(239.03)*	2600	20.452 *(77.419)*	0.447 *(0.272)*	15.67 *(3.087)*	169 *(76.2)*	60 *(15.3)*	75 *(23.8)*	28.877 *(97.512)*
Standard Power take-off Speed (1000 rpm)—One Hour								
323.83 *(241.52)*	2347	19.280 *(72.983)*	0.417 *(0.253)*	16.80 *(3.309)*	170 *(76.4)*	60 *(15.6)*	76 *(24.2)*	28.870 *(97.490)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
280.51 *(209.18)*	2678	18.971 *(71.813)*	0.473 *(0.288)*	14.78 *(2.913)*	169 *(75.8)*	60 *(15.3)*	75 *(23.9)*	....
0.00 *(0.00)*	2813	6.888 *(26.074)*	....	....	165 *(73.9)*	59 *(15.0)*	75 *(23.6)*	....
143.96 *(107.35)*	2746	13.669 *(51.743)*	0.665 *(0.404)*	10.53 *(2.075)*	167 *(75.0)*	59 *(15.0)*	76 *(24.2)*	....
321.31 *(239.60)*	2600	20.129 *(76.197)*	0.439 *(0.267)*	15.96 *(3.144)*	171 *(76.9)*	59 *(14.7)*	76 *(24.2)*	....
72.49 *(54.06)*	2770	10.712 *(40.549)*	1.034 *(0.629)*	6.77 *(1.333)*	166 *(74.2)*	60 *(15.6)*	77 *(25.0)*	....
213.49 *(159.20)*	2716	15.967 *(60.442)*	0.523 *(0.318)*	13.37 *(2.634)*	169 *(75.8)*	60 *(15.3)*	76 *(24.4)*	....
Av 171.96 ***Av (128.23)***	**2720**	**14.389** ***(54.468)***	**0.586** ***(0.356)***	**11.95** ***(2.354)***	**168** ***(75.3)***	**59** ***(15.2)***	**76** ***(24.2)***	**28.850** ***(97.422)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 9th (2 HI LO) Gear											
266.16 *(198.47)*	15515 *(69.01)*	6.43 *(10.35)*	2599	3.77	20.074 *(75.989)*	0.528 *(0.321)*	13.26 *(2.612)*	173 *(78.3)*	57 *(13.6)*	60 *(20.3)*	28.830 *(97.350)*
75% of Pull at Maximum Power—Ten Hours 5th Gear											
216.83 *(161.69)*	12045 *(53.58)*	6.75 *(10.86)*	2697	2.67	18.349 *(69.459)*	0.592 *(0.360)*	11:82 *(2.328)*	172 *(77.9)*	54 *(11.9)*	67 *(19.4)*	29.057 *(98.120)*
50% of Pull at Maximum Power—Two Hours 5th Gear											
148.88 *(111.02)*	8054 *(35.83)*	6.93 *(11.16)*	2741	1.58	15.091 *(57.127)*	0.709 *(0.432)*	9.87 *(1.943)*	171 *(76.9)*	59 *(15.0)*	72 *(21.9)*	28.785 *(97.200)*
50% of Pull at Reduced Engine Speed—Two Hours 13th (3 LO LO) Gear											
149.34 *(111.36)*	8062 *(35.86)*	6.95 *(11.18)*	1647	1.62	19.394 *(39.347)*	0.487 *(0.296)*	14.37 *(2.830)*	172 *(77.8)*	61 *(16.1)*	75 *(23.9)*	28.710 *(96.950)*
MAXIMUM POWER IN SELECTED GEARS											
233.53 *(174.14)*	30090 *(133.85)*	2.91 *(4.58)*	2650	14.78	4th (1 LO HI) Gear			170 *(76.7)*	54 *(12.2)*	63 *(17.2)*	28.860 *(97.460)*
259.76 *(193.70)*	27689 *(123.17)*	3.52 *(5.66)*	2600	11.01	5th (1 HI INT) Gear			172 *(77.8)*	53 *(11.7)*	67 *(19.4)*	29.090 *(98.230)*
264.94 *(197.57)*	24179 *(107.55)*	4.11 *(6.61)*	2597	7.77	6th (1 HI HI) Gear			173 *(78.3)*	52 *(11.1)*	66 *(18.9)*	29.100 *(98.270)*
269.53 *(200.99)*	21361 *(95.02)*	4.73 *(7.61)*	2599	5.99	7th (2 LO LO) Gear			173 *(78.1)*	52 *(11.1)*	66 *(18.9)*	29.100 *(98.270)*
274.65 *(204.81)*	17863 *(79.46)*	5.77 *(9.28)*	2600	4.44	8th (2 LO INT) Gear			173 *(78.3)*	52 *(11.1)*	65 *(18.3)*	29.110 *(98.300)*
274.88 *(204.98)*	16047 *(71.38)*	6.42 *(10.34)*	2597	3.89	9th (2 HI LO) Gear			172 *(77.8)*	52 *(11.1)*	64 *(17.8)*	29.130 *(98.370)*
278.78 *(207.89)*	16004 *(71.19)*	6.53 *(10.51)*	2599	3.81	10th (2 LO HI) Gear			173 *(78.1)*	52 *(11.1)*	65 *(18.3)*	29.120 *(98.330)*
275.15 *(205.18)*	13271 *(59.03)*	7.78 *(12.51)*	2599	3.09	11th (2 HI INT) Gear			173 *(78.3)*	53 *(11.7)*	67 *(19.4)*	29.090 *(98.230)*
273.81 *(204.18)*	11676 *(51.94)*	8:79 *(14.15)*	2600	2.61	12th (2 HI HI) Gear			173 *(78.1)*	53 *(11.7)*	67 *(19.4)*	29.090 *(98.230)*

Department of Agricultural Engineering

Dates of Test: May 12-26, 1981

Manufacturer: MASSEY FERGUSON, INC.,
1901 Bell Avenue, Des Moines, Iowa 50315

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8406 **Fuel weight** 6.999 lbs/gal *(0.839 kg/l)* **Oil SAE** 15W-40 **API service classification** SB/SE-CA/CD **To motor** 7.753 gal *(29.348 l)* **Drained from motor** 6.976 gal *(26.407 l)* **Transmission and final drive lubricant** M. F. Permatran fluid **Total time engine was operated** 44.0 hours

ENGINE: Make Cummins Diesel **Type** eight cylinder vee with turbocharger **Serial No.** 10966576 **Crankshaft** lengthwise **Rated rpm** 2600 **Bore and stroke** 5.5" × 4.75" *(139.7 mm × 120.7 mm)* **Compression ratio** 15.5 to 1 **Displacement** 903 cu in *(14800 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with aspirator **Oil filter** one full flow cartridge and one bypass cartridge **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil **Fuel filter** two paper cartridges **Muffler** vertical **Cooling medium temperature control** two thermostats.

CHASSIS: Type four wheel with duals **Serial No.** 9D002815 **Tread width** rear 70" *(1778 mm)* to 130.5" *(3315 mm)* front 70" *(1778 mm)* to 130.5" *(3315 mm)* **Wheel base** 137" *(3480 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 83.1" *(2111 mm)* Vertical distance above roadway 49.2" *(1250 mm)* Horizontal distance from center of rear wheel tread 0.2" *(4 mm)* to the left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio with partial (3) range operator controlled powershift **Advertised speeds mph *(km/h)*** first 2.4 *(3.8)* second 2.9 *(4.6)* third 3.2 *(5.1)* fourth 3.2 *(5.2)* fifth 3.8 *(6.1)* sixth 4.3 *(6.9)* seventh 4.8 *(7.8)* eighth 5.8 *(9.3)* ninth 6.4 *(10.3)* tenth 6.5 *(10.5)* eleventh 7.7 *(12.4)* twelfth 8.7 *(14.0)* thirteenth 10.7 *(17.2)* fourteenth 12.8 *(20.6)* fifteenth 14.2 *(22.9)* sixteenth 14.4 *(23.2)* seventeenth 17.0 *(27.4)* eighteenth 19.2 *(30.9)* reverse 3.2 *(5.2)*, 3.9 *(6.3)*, 4.3 *(7.0)*, 4.4 *(7.1)*, 5.2 *(8.3)*, 5.8 *(9.4)*, **Clutch** multiple wet disc operated by foot pedal **Brakes** caliper disc hydraulically operated by foot pedal or mechanically by hand lever **Steering** hydrostatic and articulated **Turning radius** (on concrete surface without brake) right 246" *(6.25 m)* left 246" *(6.25 m)* **Turning space diameter** (on concrete surface without brake) right 516" *(13.10 m)* left 516" *(13.10 m)* **Power take-off** 1000 rpm at 2347 engine rpm.

LUGGING ABILITY IN 9th (2 HI LO) GEAR

Crankshaft Speed rpm	2597	2338	2084	1822	1560	1297
Pull—lbs *(kN)*	16047 *(71.38)*	18163 *(80.79)*	19448 *(86.51)*	19814 *(88.13)*	19499 *(86.74)*	18933 *(84.22)*
Increase in Pull %	0	13	21	23	22	18
Power—Hp *(kW)*	274.88 *(204.98)*	278.07 *(207.36)*	263.68 *(196.62)*	234.43 *(174.81)*	197.84 *(147.53)*	160.05 *(119.35)*
Speed—Mph *(km/h)*	6.42 *(10.34)*	5.74 *(9.24)*	5.08 *(8.18)*	4.44 *(7.14)*	3.80 *(6.12)*	3.17 *(5.10)*
Slip %	3.89	4.60	5.22	5.38	5.22	5.07

TRACTOR SOUND LEVEL WITH CAB	dB(A)
Maximum Available Power--Two Hours	83.5
75% of Pull at Maximum Power—Ten Hours	83.0
50% of Pull at Maximum Power—Two Hours	83.0
50% of Pull at Reduced Engine Speed—Two Hours	78.5
Bystander in 17th (3 HI INT) gear	93.5

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Four 23.1-34; 8; inner 16 *(110)* outer 12 *(85)*	Four 23.1-34; 8; inner 16 *(110)* outer 12 *(85)*
Ballast	—Liquid (each inner)	1330 lb *(603 kg)*	None
	—Cast Iron (each)	None	None
Front Tires	—No., size, ply & psi *(kPa)*	Four 23.1-34, 8; inner 16 *(110)* outer 12 *(85)*	Four 23.1-34; 8; inner 16 *(110)* outer 12 *(85)*
Ballast	—Liquid (each inner)	158 lb *(72 kg)*	None
	—Cast Iron (each)	None	None
Height of Drawbar		22 in *(560 mm)*	22 in *(560 mm)*
Static Weight with Operator	—Rear	14840 lb *(6731 kg)*	12180 lb *(5525 kg)*
	Front	19100 lb *(8664 kg)*	18785 lb *(8521 kg)*
	Total	33940 lb *(15395 kg)*	30965 lb *(14046 kg)*

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 148°F *(64.3°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1391.**

LOUIS I. LEVITICUS
Engineer-in Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

Massey Ferguson MF 4900 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1392 — MASSEY FERGUSON MF 184-4 DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption			Temperature °F (°C)			Barometer inch Hg (kPa)
		gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—611 rpm)								
62.45 *(46.57)*	2200	4.067 *(15.395)*	0.456 *(0.278)*	15.35 *(3.025)*	201 *(93.7)*	60 *(15.6)*	75 *(23.9)*	28.900 *(97.591)*
Standard Power take-off Speed (540 rpm)—One Hour								
59.56 *(44.41)*	1943	3.629 *(13.737)*	0.427 *(0.260)*	16.41 *(3.233)*	203 *(94.8)*	61 *(15.9)*	76 *(24.4)*	28.900 *(97.591)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
54.71 *(40.80)*	2266	3.626 *(13.726)*	0.465 *(0.283)*	15.09 *(2.972)*	190 *(87.5)*	60 *(15.6)*	74 *(23.3)*	....
0.00 *(0.00)*	2362	1.567 *(5.932)*	....	....	151 *(66.1)*	60 *(15.6)*	75 *(23.6)*	....
28.04 *(20.91)*	2324	2.286 *(8.653)*	0.571 *(0.348)*	12.26 *(2.417)*	166 *(74.4)*	60 *(15.6)*	75 *(23.6)*	....
62.86 *(46.87)*	2200	4.097 *(15.509)*	0.457 *(0.278)*	15.34 *(3.022)*	197 *(91.7)*	61 *(15.8)*	76 *(24.2)*	....
14.28 *(10.65)*	2368	1.858 *(7.033)*	0.912 *(0.555)*	7.68 *(1.514)*	160 *(70.8)*	60 *(15.6)*	75 *(23.9)*	....
41.56 *(30.99)*	2295	2.856 *(10.811)*	0.482 *(0.293)*	14.55 *(2.867)*	175 *(79.4)*	61 *(16.1)*	75 *(23.9)*	....
Av 33.58 ***Av (25.04)***	**2302**	**2.715** ***(10.277)***	**0.567** ***(0.345)***	**12.37** ***(2.437)***	**173** ***(78.3)***	**60** ***(15.7)***	**75** ***(23.8)***	**28.913** ***(97.636)***

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F (°C)			Barom. inch Hg (kPa)
					gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 9th Gear											
50.41 *(37.59)*	3356 *(14.93)*	5.63 *(9.06)*	2200	7.07	3.996 *(15.127)*	0.555 *(0.338)*	12.61 *(2.485)*	191 *(88.1)*	53 *(11.4)*	70 *(20.8)*	28.920 *(97.660)*
75% of Pull at Maximum Power—Ten Hours 9th Gear											
41.25 *(30.76)*	2589 *(11.51)*	5.98 *(9.62)*	2284	5.05	3.407 *(12.898)*	0.579 *(0.352)*	12.11 *(2.385)*	181 *(82.9)*	56 *(13.1)*	69 *(20.6)*	28.814 *(97.301)*
50% of Pull at Maximum Power—Two Hours 9th Gear											
28.41 *(21.19)*	1726 *(7.68)*	6.17 *(9.93)*	2323	3.55	2.658 *(10.062)*	0.655 *(0.399)*	10.69 *(2.106)*	160 *(71.1)*	56 *(13.3)*	62 *(16.4)*	28.755 *(97.100)*
50% of Pull at Reduced Engine Speed—Two Hours 11th Gear											
28.60 *(21.33)*	1731 *(7.70)*	6.19 *(9.97)*	1475	3.22	2.052 *(7.766)*	0.503 *(0.306)*	13.94 *(2.747)*	169 *(76.1)*	56 *(13.3)*	66 *(18.6)*	28.770 *(97.150)*
MAXIMUM POWER IN SELECTED GEARS											
49.08 *(36.60)*	5500 *(24.47)*	3.35 *(5.38)*	2232	14.94	7th Gear			171 *(76.9)*	43 *(6.1)*	47 *(8.3)*	29.090 *(98.230)*
52.20 *(38.93)*	4434 *(19.72)*	4.42 *(7.11)*	2199	9.66	8th Gear			182 *(83.3)*	52 *(11.1)*	64 *(17.8)*	28.930 *(97.690)*
51.85 *(38.66)*	3447 *(15.33)*	5.64 *(9.08)*	2201	6.98	9th Gear			180 *(82.2)*	50 *(10.0)*	59 *(15.0)*	28.910 *(97.620)*
52.38 *(39.06)*	2756 *(12.26)*	7.13 *(11.47)*	2200	5.55	10th Gear			182 *(83.3)*	52 *(11.1)*	65 *(18.3)*	28.930 *(97.690)*
51.37 *(38.30)*	2102 *(9.35)*	9.16 *(14.75)*	2201	4.14	11th Gear			182 *(83.3)*	52 *(11.1)*	67 *(19.4)*	28.920 *(97.660)*

LUGGING ABILITY IN 9th GEAR

Crankshaft Speed rpm	2201	1980	1763	1544	1314	1098	874
Pull—lbs *(kN)*	3447 *(15.33)*	3735 *(16.62)*	3957 *(17.60)*	4198 *(18.67)*	4261 *(18.95)*	4407 *(19.60)*	4246 *(18.89)*
Increase in Pull %	0	8	15	22	24	28	23
Power—Hp *(kW)*	51.85 *(38.66)*	50.17 *(37.41)*	47.06 *(35.09)*	43.46 *(32.41)*	37.41 *(27.89)*	32.18 *(24.00)*	24.78 *(18.48)*
Speed—Mph *(km/h)*	5.64 *(9.08)*	5.04 *(8.11)*	4.46 *(7.18)*	3.88 *(6.25)*	3.29 *(5.30)*	2.74 *(4.41)*	2.19 *(3.52)*
Slip %	6.98	7.71	8.07	8.78	9.02	9.49	9.14

Department of Agricultural Engineering

Dates of Test: May 11-20, 1981

Manufacturer: MASSEY FERGUSON S.P.A.
LANDINI DIVISION Via Matteotti 17, 42042
Fabrico (RE) Italy

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8416 **Fuel weight** 7.007 lbs/gal *(0.840 kg/l)* **Oil SAE** 20-20W **API service classification** CC/SE **To motor** 1.725 gal *(6.530 l)* **Drained from motor** 1.381 gal *(5.228 l)* **Transmission and final drive lubricant** M. F. Permatran fluid **Total time engine was operated** 44.5 hours

ENGINE: Make Perkins Diesel **Type** four cylinder vertical **Serial No.** LD22574U657285G **Crankshaft** lengthwise **Rated rpm** 2200 **Bore and stroke** 3.875" × 5.0" *(98.4 mm × 127.0 mm)* **Compression ratio** 16 to 1 **Displacement** 236 cu in *(3865 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** oil bath with centrifugal precleaner **Oil filter** one full flow paper cartridge **Fuel filter** one paper element **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type front wheel assist **Serial No.** 2204365 **Tread width** rear 59.1" *(1500 mm)* to 78.7" *(2000 mm)* front 60.0" *(1525 mm)* **Wheel base** 87.0" *(2210 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 34.1" *(866 mm)* Vertical distance above roadway 29.2" *(742 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 0.8 *(1.3)* second 1.3 *(2.0)* third 1.6 *(2.6)* fourth 2.0 *(3.2)* fifth 2.5 *(4.0)* sixth 3.1 *(5.0)* seventh 3.9 *(6.3)* eighth 4.9 *(7.9)* ninth 6.1 *(9.8)* tenth 7.6 *(12.2)* eleventh 9.6 *(15.5)* twelfth 15.0 *(24.2)* reverse 2.1 *(3.4)*, 3.3 *(5.3)*, 4.2 *(6.7)*, 6.5 *(10.5)* **Clutch** dry disc operated by foot pedal **Brakes** dry disc operated by two foot pedals which can be locked together and hand lever **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 180.5" *(4.58 m)* left 180.5" *(4.58 m)* (on concrete surface without brake) right 196.5" *(4.99 m)* left 196.5" *(4.99 m)* **Turning space diameter** (on concrete surface with brake applied) right 372" *(9.45 m)* left 372" *(9.45 m)* (on concrete surface without brake) right 405" *(10.29 m)* left 405" *(10.29 m)* **Power take-off** 540 rpm at 1943 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was

166°F *(74.3°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1392.**

LOUIS I. LEVITICUS
Engineer-in Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

TRACTOR SOUND LEVEL WITHOUT CAB	**dB(A)**	**Front Wheel Drive Disengaged dB (A)**
Maximum Available Power—Two Hours	100.5	100.5
75% of Pull at Maximum Power—Ten Hours		98.5
50% of Pull at Maximum Power—Two Hours		97.0
50% of Pull at Reduced Engine Speed—Two Hours		93.5
Bystander in 12th gear		87.0

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F *(°C)*			Barom. inch Hg *(kPa)*
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 9th Gear											
51.04 *(38.06)*	3285 *(14.61)*	5.83 *(9.38)*	2200	5.03	4.014 *(15.194)*	0.551 *(0.335)*	12.72 *(2.505)*	195 *(90.3)*	54 *(11.9)*	71 *(21.4)*	28.900 *(97.590)*
MAXIMUM POWER IN SELECTED GEARS											
41.89 *(31.24)*	7106 *(31.61)*	2.21 *(3.56)*	2276	14.94	5th Gear			165 *(73.6)*	53 *(11.7)*	57 *(13.9)*	28.760 *(97.120)*
53.50 *(39.90)*	4352 *(19.36)*	4.61 *(7.42)*	2198	6.74	8th Gear			182 *(83.3)*	51 *(10.6)*	63 *(17.2)*	28.930 *(97.690)*
52.59 *(39.22)*	3383 *(15.05)*	5.83 *(9.38)*	2201	5.03	9th Gear			183 *(83.9)*	51 *(10.6)*	61 *(16.1)*	28.920 *(97.660)*

TIRES, BALLAST AND WEIGHT		**With Ballast**	**Without Ballast**
Rear Tires	—No., size, ply & psi *(kPa)*	Two 16.9-30; 6; 18 *(125)*	Two 16.9-30: 6; 18 *(125)*
Ballast	—Liquid (each)	480 lb *(218 kg)*	None
	—Cast Iron (each)	None	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 11.2-24; 6; 18 *(125)*	Two 11.2-24; 6; 18 *(125)*
Ballast	—Liquid (each)	218 lb *(99 kg)*	None
	—Cast Iron (each)	None	None
Height of Drawbar		20 in *(510 mm)*	20 in *(510 mm)*
Static Weight with Operator	—Rear	4840 lb *(2196 kg)*	3880 lb *(1760 kg)*
	Front	2935 lb *(1331 kg)*	2500 lb *(1134 kg)*
	Total	7775 lb *(3527 kg)*	6380 lb *(2894 kg)*

MASSEY FERGUSON
184 4

Massey Ferguson MF 184-4 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1393 — JOHN DEERE 2040 DIESEL 8 SPEED TSS TRANSMISSION (WITH MECHANICAL FRONT WHEEL DRIVE)

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption			Temperature °F *(°C)*			
		gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—567 rpm)								
40.44	2500	2.774	0.481	14.58	184	67	75	28.810
(30.16)		*(10.501)*	*(0.293)*	*(2.872)*	*(84.6)*	*(19.6)*	*(23.8)*	*(97.287)*
Standard Power take-off Speed (540 rpm)—One Hour								
40.22	2382	2.705	0.471	14.87	185	67	75	28.810
(29.99)		*(10.240)*	*(0.287)*	*(2.929)*	*(85.0)*	*(19.4)*	*(23.7)*	*(97.287)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
35.35	2568	2.547	0.505	13.88	182	67	75	......
(26.36)		*(9.641)*	*(0.307)*	*(2.734)*	*(83.1)*	*(19.4)*	*(23.6)*	......
0.00	2662	1.156	.....	.....	173	67	74	......
(0.00)		*(4.376)*	.....	.....	*(78.3)*	*(19.4)*	*(23.3)*	......
18.01	2623	1.777	0.691	10.14	176	68	75	......
(13.43)		*(6.727)*	*(0.420)*	*(1.996)*	*(80.0)*	*(19.7)*	*(23.9)*	......
40.37	2499	2.791	0.485	14.46	184	68	75	......
(30.10)		*(10.565)*	*(0.295)*	*(2.849)*	*(84.2)*	*(19.7)*	*(23.9)*	......
9.08	2640	1.447	1.117	6.27	175	68	75	......
(6.77)		*(5.477)*	*(0.680)*	*(1.236)*	*(79.2)*	*(20.0)*	*(23.9)*	......
26.71	2592	2.128	0.558	12.55	179	68	76	......
(19.92)		*(8.055)*	*(0.340)*	*(2.473)*	*(81.7)*	*(19.7)*	*(24.2)*	......
Av 21.59	**2597**	**1.974**	**0.641**	**10.93**	**178**	**67**	**75**	**28.810**
Av (16.10)		*(7.472)*	*(0.390)*	*(2.155)*	*(81.1)*	*(19.7)*	*(23.8)*	*(97.287)*

DRAWBAR PERFORMANCE (Front Wheel Drive Engaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F *(°C)*			
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 4th Gear											
31.90	2325	5.14	2501	4.20	2.729	0.600	11.69	187	63	80	28.835
(23.79)	*(10.34)*	*(8.28)*			*(10.330)*	*(0.365)*	*(2.303)*	*(85.8)*	*(16.9)*	*(26.4)*	*(97.371)*
75% of Pull at Maximum Power—Ten Hours 4th Gear											
25.67	1812	5.31	2551	2.94	2.397	0.654	10.71	186	70	85	28.797
(19.14)	*(8.06)*	*(8.55)*			*(9.075)*	*(0.398)*	*(2.109)*	*(85.6)*	*(21.1)*	*(29.4)*	*(97.243)*
50% of Pull at Maximum Power—Two Hours 4th Gear											
17.50	1212	5.42	2581	2.22	1.998	0.800	8.76	181	66	79	28.825
(13.05)	*(5.39)*	*(8.72)*			*(7.562)*	*(0.487)*	*(1.726)*	*(82.5)*	*(18.9)*	*(25.8)*	*(97.340)*
50% of Pull at Reduced Engine Speed—Two Hours 6th Gear											
17.68	1221	5.43	1460	2.05	1.409	0.558	12.55	183	67	83	28.785
(13.19)	*(5.43)*	*(8.74)*			*(5.334)*	*(0.340)*	*(2.472)*	*(83.6)*	*(19.4)*	*(28.3)*	*(97.203)*
MAXIMUM POWER IN SELECTED GEARS											
25.70	5541	1.74	2550	14.94	1st Gear			177	57	64	28.820
(19.16)	*(24.65)*	*(2.80)*						*(80.3)*	*(13.9)*	*(17.8)*	*(97.321)*
31.78	4818	2.47	2499	10.68	2nd Gear			185	64	75	28.850
(23.70)	*(21.43)*	*(3.98)*						*(85.0)*	*(17.8)*	*(23.9)*	*(97.422)*
32.95	3301	3.74	2499	6.03	3rd Gear			185	64	74	28.850
(24.57)	*(14.68)*	*(6.02)*						*(84.7)*	*(17.8)*	*(23.3)*	*(97.422)*
33.21	2415	5.16	2500	3.97	4th Gear			184	64	72	28.850
(24.76)	*(10.74)*	*(8.30)*						*(84.4)*	*(17.8)*	*(22.2)*	*(97.420)*
32.80	1847	6.66	2500	3.14	5th Gear			186	65	76	28.850
(24.46)	*(8.22)*	*(10.72)*						*(85.6)*	*(18.3)*	*(24.4)*	*(97.420)*
31.15	1256	9.30	2500	2.02	6th Gear			185	65	77	28.840
(23.23)	*(5.58)*	*(14.97)*						*(85.0)*	*(18.3)*	*(25.0)*	*(97.390)*

Department of Agricultural Engineering

Dates of Test: May 26 to June 6, 1981

Manufacturer: JOHN DEERE WERKE
MANNHEIM, Mannheim, West Germany

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8417 **Fuel weight** 7.008 lbs/gal *(0.840 kg/l)* **Oil SAE** 30 **API service classification** CD/SD **To motor** 1.920 gal *(7.268 l)* **Drained from motor** 1.855 gal *(7.022 l)* **Transmission and final drive lubricant** John Deere Hy Gard Fluid **Front axle lubricant** EP SAE 90 transmission oil **Total time engine was operated** 38.5 hours.

ENGINE: Make John Deere Diesel **Type** three cylinder vertical **Serial No.** 3179DL06 482980CD **Crankshaft** lengthwise **Rated rpm** 2500 **Bore and stroke** 4.19" × 4.33" *(106.5 mm × 110 mm)* **Compression ratio** 16.8 to 1 **Displacement** 179 cu in *(2934 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements **Oil filter** one full flow cartridge **Oil cooler** engine coolant heat exchanger for crankcase oil **Fuel filter** one paper element and one mesh strainer **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type front wheel assist **Serial No.** 2040-400244L **Tread width** rear 53.5" *(1360 mm)* to 73.2" *(1860 mm)* front 53" *(1350 mm)* to 77" *(1950 mm)* **Wheel base** 81" *(2060 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 33.3" *(845 mm)* Vertical distance above roadway 29.8" *(757 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.9 *(3.1)* second 2.6 *(4.2)* third 3.8 *(6.1)* fourth 5.1 *(8.2)* fifth 6.5 *(10.5)* sixth 9.0 *(14.5)* seventh 13.0 *(20.9)* eighth 17.5 *(28.2)* reverse 2.9 *(4.7)*, 4.0 *(6.5)*, 5.8 *(9.4)*, 7.8 *(12.6)* **Clutch** single dry disc operated by foot pedal **Brakes** wet disc hydraulically operated by two foot pedals which can be locked together **Steering** power assist **Turning radius** (on concrete surface with brake applied) right 142" *(3.60 m)* left 142" *(3.60 m)* (on concrete surface without brake) right 177" *(4.50 m)* left 177" *(4.50 m)* **Turning space diameter** (on concrete surface with brake applied) right 308" *(7.82 m)* left 308" *(7.82 m)* (on concrete surface without brake) right 378" *(9.60 m)* left 378" *(9.60 m)* **Power take-off** 540 rpm at 2382 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

LUGGING ABILITY IN 4th GEAR

Crankshaft Speed rpm	2500	2254	1999	1749	1500	1255
Pull—lbs ***(kN)***	2415 *(10.74)*	2624 *(11.67)*	2753 *(12.25)*	2818 *(12.53)*	2861 *(12.73)*	2817 *(12.53)*
Increase in Pull %	0	9	14	17	18	17
Power—Hp ***(kW)***	33.21 *(24.76)*	32.38 *(24.15)*	30.02 *(22.38)*	26.83 *(20.01)*	23.35 *(17.41)*	19.23 *(14.34)*
Speed—Mph ***(km/h)***	5.16 *(8.30)*	4.63 *(7.45)*	4.09 *(6.58)*	3.57 *(5.75)*	3.06 *(4.93)*	2.56 *(4.12)*
Slip %	3.97	4.29	4.67	4.80	5.05	4.92

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Engaged dB (A)
Maximum Available Power—Two Hours	95.0	95.0
75% of Pull at Maximum Power—Ten Hours		94.0
50% of Pull at Maximum Power—Two Hours		95.0
50% of Pull at Reduced Engine Speed—Two Hours		88.5
Bystander in 7th gear	85.5	

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	Fuel Consumption lb/hp.hr *(kg/kW.h)*	Fuel Consumption Hp.hr/gal *(kW.h/l)*	Temp. °F (°C) Cool-ing med	Temp. °F (°C) Air wet bulb	Temp. °F (°C) Air dry bulb	Barom. inch Hg *(kPa)*
					Maximum Available Power—Two Hours 4th Gear						
31.11 *(23.20)*	2304 *(10.25)*	5.06 *(8.15)*	2500	5.69	2.676 *(10.128)*	0.603 *(0.367)*	11.63 *(2.290)*	189 *(87.2)*	64 *(17.5)*	85 *(29.2)*	28.820 *(97.321)*
					MAXIMUM POWER IN SELECTED GEARS						
27.36 *(20.40)*	4282 *(19.05)*	2.40 *(3.86)*	2538	14.84	2nd Gear			180 *(82.2)*	60 *(15.6)*	71 *(21.7)*	28.840 *(97.388)*
32.35 *(24.13)*	2387 *(10.62)*	5.08 *(8.18)*	2503	5.54	4th Gear			184 *(84.4)*	64 *(17.8)*	73 *(22.8)*	28.850 *(97.420)*

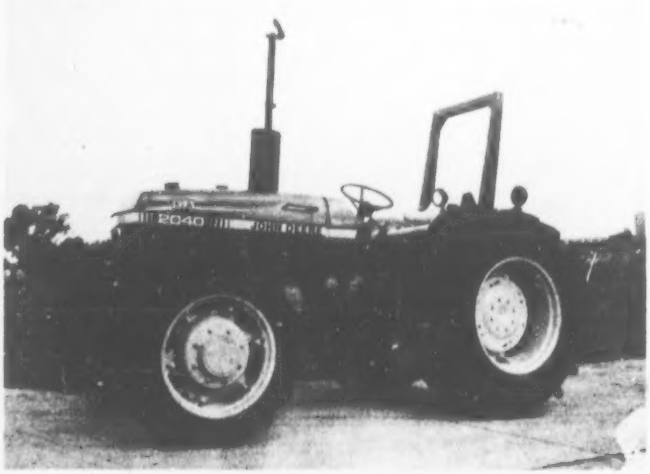
TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 16.9-28; 6; 16 *(110)*	Two 16.9-28; 6; 16 *(110)*
Ballast	—Liquid (each)	None	None
	—Test Equip. (each)	85 lb *(38 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 9.5-24; 6; 16 *(110)*	Two 9.5-24; 6; 16 *(110)*
Ballast	—Liquid (each)	None	None
	—Test Equip. (each)	48 lb *(22 kg)*	None
Height of Drawbar		16.5 in *(420 mm)*	16.5 in *(420 mm)*
Static Weight with Operator	—Rear	3645 lb *(1653 kg)*	3475 lb *(1576 kg)*
	Front	2395 lb *(1086 kg)*	2300 lb *(1043 kg)*
	Total	6040 lb *(2739 kg)*	5775 lb *(2619 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 148°F *(64.4°C)*. Six gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1393.**

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers



John Deere 2040 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1394 — JOHN DEERE 2240 DIESEL
8 SPEED TSS TRANSMISSION
(WITH MECHANICAL FRONT WHEEL DRIVE)

POWER TAKE-OFF PERFORMANCE

Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption			Temperature °F (°C)			Barometer inch Hg (kPa)
		gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—567 rpm)								
50.90 *(37.96)*	2500	3.404 *(12.886)*	0.469 *(0.285)*	14.96 *(2.946)*	190 *(87.9)*	64 *(17.9)*	76 *(24.3)*	28.863 *(97.467)*
Standard Power take-off Speed (540 rpm)—One Hour								
49.20 *(36.69)*	2383	3.211 *(12.155)*	0.457 *(0.278)*	15.32 *(3.019)*	191 *(88.3)*	65 *(18.3)*	77 *(24.9)*	28.855 *(97.439)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
45.07 *(33.61)*	2604	3.095 *(11.716)*	0.481 *(0.293)*	14.56 *(2.869)*	186 *(85.6)*	65 *(18.3)*	77 *(25.0)*	....
0.00 *(0.00)*	2651	1.336 *(5.057)*	....	....	173 *(78.3)*	65 *(18.3)*	78 *(25.3)*	....
22.67 *(16.91)*	2622	2.025 *(7.665)*	0.626 *(0.381)*	11.20 *(2.206)*	177 *(80.3)*	66 *(18.6)*	78 *(25.3)*	....
51.24 *(38.21)*	2499	3.408 *(12.901)*	0.466 *(0.284)*	15.04 *(2.962)*	191 *(88.1)*	66 *(18.6)*	78 *(25.3)*	....
11.42 *(8.52)*	2640	1.618 *(6.125)*	0.993 *(0.604)*	7.06 *(1.391)*	175 *(79.2)*	66 *(18.9)*	78 *(25.6)*	....
33.71 *(25.14)*	2596	2.487 *(9.414)*	0.517 *(0.315)*	13.55 *(2.670)*	181 *(82.5)*	67 *(19.2)*	80 *(26.4)*	....
Av 27.35 ***Av (20.39)***	**2602**	**2.328** ***(8.812)***	**0.597** ***(0.363)***	**11.75** ***(2.314)***	**180** ***(82.3)***	**66** ***(18.7)***	**78** ***(25.4)***	**28.843** ***(97.397)***

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F (°C)			Barom. inch Hg (kPa)
					gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 4th Gear											
40.16 *(29.95)*	2958 *(13.16)*	5.09 *(8.19)*	2502	4.88	3.353 *(12.694)*	0.585 *(0.356)*	11.98 *(2.360)*	194 *(90.0)*	66 *(18.9)*	78 *(25.6)*	28.750 *(97.080)*
75% of Pull at Maximum Power—Ten Hours 4th Gear											
33.46 *(24.95)*	2334 *(10.38)*	5.38 *(8.65)*	2604	3.53	2.922 *(11.060)*	0.612 *(0.372)*	11.45 *(2.256)*	186 *(85.4)*	67 *(19.4)*	75 *(23.8)*	28.715 *(96.966)*
50% of Pull at Maximum Power—Two Hours 4th Gear											
22.67 *(16.91)*	1547 *(6.88)*	5.50 *(8.85)*	2628	2.31	2.319 *(8.778)*	0.717 *(0.436)*	9.78 *(1.926)*	184 *(84.4)*	70 *(20.8)*	83 *(28.3)*	28.710 *(96.950)*
50% of Pull at Reduced Engine Speed—Two Hours 6th Gear											
22.76 *(16.97)*	1552 *(6.90)*	5.50 *(8.85)*	1491	2.51	1.766 *(6.684)*	0.544 *(0.331)*	12.89 *(2.539)*	182 *(83.1)*	64 *(17.8)*	77 *(24.7)*	28.805 *(97.270)*
MAXIMUM POWER IN SELECTED GEARS											
36.92 *(27.53)*	5777 *(25.70)*	2.40 *(3.86)*	2550	14.92	2nd Gear			182 *(83.3)*	59 *(15.0)*	64 *(17.8)*	28.840 *(97.390)*
41.22 *(30.73)*	4208 *(18.72)*	3.67 *(5.91)*	2500	7.43	3rd Gear			191 *(88.1)*	58 *(14.4)*	67 *(19.4)*	28.780 *(97.190)*
42.13 *(31.42)*	3107 *(13.82)*	5.08 *(8.18)*	2500	4.94	4th Gear			190 *(87.5)*	56 *(13.3)*	65 *(18.3)*	28.790 *(97.220)*
41.74 *(31.13)*	2373 *(10.56)*	6.60 *(10.61)*	2500	3.68	5th Gear			189 *(87.2)*	59 *(15.0)*	68 *(20.0)*	28.780 *(97.190)*
39.89 *(29.75)*	1620 *(7.20)*	9.24 *(14.86)*	2500	2.31	6th Gear			189 *(87.2)*	61 *(16.1)*	72 *(22.2)*	28.780 *(97.190)*

LUGGING ABILITY IN 4th GEAR

Crankshaft Speed rpm	2500	2247	1996	1741	1501	1254
Pull—lbs *(kN)*	3107 *(13.82)*	3319 *(14.76)*	3477 *(15.47)*	3623 *(16.12)*	3727 *(16.58)*	3600 *(16.01)*
Increase in Pull %	0	7	12	17	20	16
Power—Hp *(kW)*	42.13 *(31.42)*	40.20 *(29.97)*	37.29 *(27.80)*	33.78 *(25.19)*	29.86 *(22.27)*	24.17 *(18.02)*
Speed—Mph *(km/h)*	5.08 *(8.18)*	4.54 *(7.31)*	4.02 *(6.47)*	3.50 *(5.63)*	3.00 *(4.83)*	2.52 *(4.05)*
Slip %	4.94	5.56	5.80	6.05	6.53	6.05

Department of Agricultural Engineering

Dates of Test: May 26 to June 4, 1981

Manufacturer: JOHN DEERE WERKE
MANNHEIM, Mannheim, West Germany

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8417 **Fuel weight** 7.008 lbs/gal *(0.840 kg/l)* **Oil** SAE 30 **API service classification** CD/SD **To motor** 1.927 gal *(7.294 l)* **Drained from motor** 1.557 gal *(5.894 l)* **Transmission and final drive lubricant** John Deere Hy Gard Fluid **Front axle lubricant** EP SAE 90 transmission oil **Total time engine was operated** 40.0 hours.

ENGINE: Make John Deere Diesel **Type** three cylinder vertical **Serial No.** 3179DL01 480974CD **Crankshaft** lengthwise **Rated rpm** 2500 **Bore and stroke** 4.19" × 4.33" *(106.5 mm × 110 mm)* **Compression ratio** 16.8 to 1 **Displacement** 179 cu in *(2934 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements **Oil filter** one full flow cartridge **Oil cooler** engine coolant heat exchanger for crankcase oil **Fuel filter** one paper element and one mesh strainer **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type front wheel assist **Serial No.** 2240-400231L **Tread width** rear 55.1" *(1400 mm)* to 78.7" *(2000 mm)* front 53" *(1350 mm)* to 77" *(1950 mm)* **Wheel base** 81" *(2060 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 32.6" *(827 mm)* Vertical distance above roadway 29.8" *(757 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.9 *(3.1)* second 2.6 *(4.2)* third 3.8 *(6.1)* fourth 5.1 *(8.2)* fifth 6.5 *(10.5)* sixth 9.0 *(14.5)* seventh 13.0 *(20.9)* eighth 17.5 *(28.2)* reverse 2.9 *(4.7)*, 4.0 *(6.5)*, 5.8 *(9.4)*, 7.8 *(12.6)* **Clutch** single dry disc operated by foot pedal **Brakes** wet disc hydraulically operated by two foot pedals which can be locked together **Steering** power assist **Turning radius** (on concrete surface with brake applied) right 142" *(3.60 m)* left 142" *(3.60 m)* (on concrete surface without brake) right 177" *(4.50 m)* left 177" *(4.50 m)* **Turning space diameter** (on concrete surface with brake applied) right 308" *(7.82 m)* left 308" *(7.82 m)* (on concrete surface without brake) right 378" *(9.60 m)* left 378" *(9.60 m)* **Power take-off** 540 rpm at 2383 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 150°F *(65.7°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Engaged dB (A)
Maximum Available Power—Two Hours	96.0	95.5
75% of Pull at Maximum Power—Ten Hours		95.5
50% of Pull at Maximum Power—Two Hours		94.0
50% of Pull at Reduced Engine Speed—Two Hours		89.0
Bystander in 7th gear	86.0	

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	Fuel Consumption lb/hp.hr *(kg/kW.h)*	Fuel Consumption Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Temp. °F *(°C)* Air wet bulb	Temp. °F *(°C)* Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 4th Gear											
39.78	3009	4.96	2500	7.04	3.353	0.591	11.86	189	61	72	28.835
(29.66)	*(13.38)*	*(7.98)*			*(12.694)*	*(0.359)*	*(2.337)*	*(87.2)*	*(16.1)*	*(21.9)*	*(97.370)*
MAXIMUM POWER IN SELECTED GEARS											
29.26	4494	2.44	2605	14.90	2nd Gear			178	58	62	28.840
(21.82)	*(19.99)*	*(3.93)*						*(81.1)*	*(14.4)*	*(16.7)*	*(97.390)*
41.05	3100	4.97	2500	6.83	4th Gear			190	57	66	28.790
(30.61)	*(13.79)*	*(7.99)*						*(87.8)*	*(13.9)*	*(18.9)*	*(97.220)*

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 16.9-28; 6; 16 *(110)*	Two 16.9-28; 6; 16 *(110)*
Ballast	—Liquid (each)	None	None
	—Test Equip. (each)	68 lb *(31 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 9.5-24; 6; 16 *(110)*	Two 9.5-24; 6; 16 *(110)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	88 lb *(40 kg)*	None
Height of Drawbar		16.5 in *(420 mm)*	16.5 in *(420 mm)*
Static Weight with Operator	—Rear	3730 lb *(1692 kg)*	3595 lb *(1631 kg)*
	Front	2475 lb *(1123 kg)*	2300 lb *(1043 kg)*
	Total	6205 lb *(2815 kg)*	5895 lb *(2674 kg)*

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1395**.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

John Deere 2240 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1395 — WHITE-ISEKI 2-45 DIESEL 20 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption			Temperature °F *(°C)*			Barometer inch Hg *(kPa)*
			gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—670 rpm)									
	43.73 *(32.61)*	2250	3.361 *(12.723)*	0.539 *(0.328)*	13.01 *(2.563)*	195 *(90.6)*	68 *(20.2)*	75 *(23.8)*	28.520 *(96.308)*
Standard Power take-off Speed (540 rpm)—One Hour									
	36.62 *(27.31)*	1812	2.882 *(10.910)*	0.552 *(0.336)*	12.70 *(2.503)*	204 *(95.4)*	68 *(19.8)*	75 *(23.9)*	28.503 *(96.251)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	39.00 *(29.08)*	2360	2.872 *(10.872)*	0.516 *(0.314)*	13.58 *(2.675)*	185 *(85.0)*	68 *(20.0)*	76 *(24.4)*	....
	0.00 *(0.00)*	2440	0.993 *(3.759)*	....	....	178 *(81.1)*	68 *(20.0)*	76 *(24.4)*	....
	19.75 *(14.73)*	2390	1.772 *(6.708)*	0.629 *(0.383)*	11.14 *(2.196)*	181 *(82.8)*	69 *(20.6)*	78 *(25.6)*	....
	44.05 *(32.85)*	2250	3.403 *(12.882)*	0.541 *(0.329)*	12.94 *(2.550)*	192 *(88.9)*	69 *(20.6)*	78 *(25.6)*	....
	9.95 *(7.42)*	2408	1.340 *(5.072)*	0.944 *(0.574)*	7.43 *(1.463)*	179 *(81.4)*	70 *(21.1)*	81 *(26.9)*	....
	29.43 *(21.95)*	2376	2.256 *(8.540)*	0.537 *(0.327)*	13.05 *(2.570)*	182 *(83.3)*	70 *(21.1)*	82 *(27.8)*	....
Av *Av*	**23.70** *(17.67)*	**2371**	**2.106** *(7.972)*	**0.623** *(0.379)*	**11.25** *(2.217)*	**183** *(83.8)*	**69** *(20.6)*	**78** *(25.8)*	**28.510** *(96.274)*

DRAWBAR PERFORMANCE
(Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F *(°C)*			Barom. inch Hg *(kPa)*
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 18th (3HH) Gear											
36.16 *(26.96)*	2360 *(10.50)*	5.75 *(9.25)*	2249	6.03	3.300 *(12.491)*	0.640 *(0.389)*	10.96 *(2.159)*	191 *(88.3)*	65 *(18.3)*	76 *(24.2)*	28.805 *(97.270)*
75% of Pull at Maximum Power—Ten Hours 18th (3HH) Gear											
29.89 *(22.29)*	1821 *(8.10)*	6.16 *(9.91)*	2364	4.22	2.718 *(10.290)*	0.637 *(0.388)*	11.00 *(2.166)*	187 *(86.0)*	74 *(23.3)*	83 *(28.3)*	28.728 *(97.010)*
50% of Pull at Maximum Power—Two Hours 18th (3HH) Gear											
20.34 *(15.17)*	1219 *(5.42)*	6.26 *(10.07)*	2379	3.38	2.105 *(7.967)*	0.725 *(0.441)*	9.66 *(1.903)*	184 *(84.2)*	73 *(22.5)*	82 *(27.5)*	28.530 *(96.342)*
50% of Pull at Reduced Engine Speed—Two Hours 19th (4HH) Gear											
20.42 *(15.22)*	1224 *(5.44)*	6.26 *(10.07)*	1534	3.23	1.891 *(7.157)*	0.649 *(0.395)*	10.80 *(2.127)*	189 *(87.2)*	75 *(23.6)*	87 *(30.6)*	28.510 *(96.274)*
MAXIMUM POWER IN SELECTED GEARS											
30.23 *(22.55)*	4455 *(19.82)*	2.54 *(4.10)*	2354	14.92	14th (5LH) Gear			185 *(84.7)*	71 *(21.7)*	75 *(23.9)*	28.560 *(96.443)*
34.26 *(25.55)*	4114 *(18.30)*	3.12 *(5.03)*	2251	12.56	15th (5HL) Gear			191 *(88.3)*	72 *(22.2)*	77 *(25.0)*	28.550 *(96.409)*
34.62 *(25.82)*	3813 *(16.96)*	3.40 *(5.48)*	2250	11.01	16th (1HH) Gear			194 *(90.0)*	72 *(22.2)*	79 *(26.1)*	28.550 *(96.409)*
37.32 *(27.83)*	3529 *(15.70)*	3.97 *(6.38)*	2250	9.74	17th (2HH) Gear			186 *(85.6)*	63 *(17.2)*	72 *(22.2)*	28.840 *(97.388)*
37.17 *(27.72)*	2420 *(10.77)*	5.76 *(9.27)*	2252	5.97	18th (3HH) Gear			187 *(86.1)*	61 *(16.1)*	68 *(20.0)*	28.820 *(97.321)*
35.88 *(26.75)*	1471 *(6.54)*	9.15 *(14.72)*	2251	3.63	19th (4HH) Gear			188 *(86.7)*	63 *(17.2)*	72 *(22.2)*	28.850 *(97.422)*

Department of Agricultural Engineering

Dates of Test: June 2-15, 1981

Manufacturer: ISEKI AND CO., LTD., Tokyo, Japan

FUEL, OIL AND TIME: **Fuel** No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60° *(15°/15°)*** 0.8417 **Fuel weight** 7.008 lbs/gal *(0.840 kg/l)* **Oil** White Farm Equipment Turbo Diesel Oil **SAE** 30 **API service classification** SD-SE/CC-CD **To motor** 2.093 gal *(7.923 l)* **Drained from motor** 1.975 gal *(7.476 l)* **Transmission and final drive lubricant** White Farm Equipment Co. Universal tractor hydraulic transmission oil **Total time engine was operated** 37.5 hours

ENGINE: **Make** ISUZU Diesel **Model** 4BA1 **Type** four cylinder vertical **Serial No.** 604300 **Crankshaft** lengthwise **Rated rpm** 2250 **Bore and stroke** 3.858" × 3.62" *(98 mm × 92 mm)* **Compression ratio** 19 to 1 **Displacement** 169.3 cu in *(2775 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements **Oil filter** one paper element **Fuel filter** two paper elements with sediment bowl and screen **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: **Type** front wheel assist **Serial No.** 00198 K **Tread width** rear 55.5" *(1410 mm)* to 79.1" *(2010 mm)* front 59" *(1500 mm)* **Wheel base** 79.9" *(2030 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 33.9" *(861 mm)* Vertical distance above roadway 30.9" *(785 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 0.2 *(0.3)* second 0.2 *(0.3)* third 0.3 *(0.4)* fourth 0.4 *(0.7)* fifth 0.7 *(1.1)* sixth 0.7 *(1.1)* seventh 0.8 *(1.3)* eighth 0.9 *(1.4)* ninth 1.0 *(1.6)* tenth 1.1 *(1.8)* eleventh 1.4 *(2.3)* twelfth 1.7 *(2.7)* thirteenth 2.2 *(3.5)* fourteenth 2.8 *(4.5)* fifteenth 3.5 *(5.6)* sixteenth 3.7 *(6.0)* seventeenth 4.3 *(6.9)* eighteenth 5.9 *(9.5)* nineteenth 9.2 *(14.8)* twentieth 14.7 *(23.6)* reverse 0.3 *(0.5)*, 1.2 *(1.9)*, 1.5 *(2.4)*, 6.4 *(10.3)* **Clutch** single dry disc operated by foot pedal **Brakes** multiple wet disc operated by two foot pedals which can be locked together and hand lever **Steering** power assist **Turning radius** (on concrete surface with brake applied) right 118" *(3.00 m)* left 118" *(3.00 m)* (on concrete surface without brake) right 137.8" *(3.50 m)* left 137.8" *(3.50 m)* **Turning space diameter** (on concrete surface with brake applied) right 240" *(6.10 m)* left 240" *(6.10 m)* (on concrete surface without brake) right 279.6" *(7.10 m)* left 279.6" *(7.10 m)* **Power take-off** 540 rpm at 1812 engine rpm.

LUGGING ABILITY IN 18th (3HH) GEAR

Crankshaft Speed rpm	2252	2029	1798	1577	1349	1125
Pull—lbs *(kN)*	2420 *(10.77)*	2470 *(10.99)*	2596 *(11.55)*	2671 *(11.88)*	2629 *(11.70)*	2544 *(11.32)*
Increase in Pull %	0	2	7	10	9	5
Power—Hp *(kW)*	37.17 *(27.72)*	34.13 *(25.45)*	31.67 *(23.61)*	28.50 *(21.26)*	24.01 *(17.90)*	19.42 *(14.48)*
Speed—Mph *(km/h)*	5.76 *(9.27)*	5.18 *(8.34)*	4.57 *(7.36)*	4.00 *(6.44)*	3.42 *(5.51)*	2.86 *(4.61)*
Slip %	5.97	6.09	6.43	6.67	6.67	6.32

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	90.0	90.0
75% of Pull at Maximum Power—Ten Hours		90.5
50% of Pull at Maximum Power—Two Hours		89.5
50% of Pull at Reduced Engine Speed—Two Hours		88.5
Bystander in 20th (5HH) gear		80.5

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F (°C)			Barom. inch Hg *(kPa)*
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 18th (3HH) Gear											
35.50 *(26.47)*	2255 *(10.03)*	5.90 *(9.50)*	2249	4.05	3.300 *(12.491)*	0.651 *(0.396)*	10.76 *(2.119)*	194 *(89.7)*	69 *(20.6)*	81 *(27.2)*	28.765 *(97.135)*
MAXIMUM POWER IN SELECTED GEARS											
31.21 *(23.28)*	5834 *(25.95)*	2.01 *(3.23)*	2356	14.95	13th (4HL) Gear			186 *(85.3)*	70 *(21.1)*	73 *(22.8)*	28.570 *(96.477)*
37.78 *(28.18)*	3422 *(15.22)*	4.14 *(6.66)*	2251	6.30	17th (2HH) Gear			188 *(86.7)*	63 *(17.2)*	71 *(21.7)*	28.840 *(97.388)*
37.03 *(27.62,*	2355 *(10.47)*	5.90 *(9.49)*	2248	4.14	18th (3HH) Gear			187 *(86.1)*	62 *(16.7)*	70 *(21.1)*	28.830 *(97.355)*

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 14.9-28; 6; 16 *(110)*	Two 14.9-28; 6; 16 *(110)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	270 lb *(122 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 8.3-24; 8; 22 *(150)*	Two 8.3-24; 8; 22 *(150)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	60 lb *(27 kg)*	None
Height of drawbar		17.5 in *(445 mm)*	17.5 in *(445 mm)*
Static Weight with Operator—Rear		4055 lb *(1839 kg)*	3515 lb *(1594 kg)*
Front		2575 lb *(1168 kg)*	2455 lb *(1114 kg)*
Total		6630 lb *(3007 kg)*	5970 lb *(2708 kg)*

REPAIRS and ADJUSTMENTS: After a short circuit during the run-in period, the wiring harness and starting switch were replaced.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 161°F *(71.9°C)*. Six gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1395.**

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

White-Iseki 2-45 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1396 — WHITE-ISEKI 2-62 DIESEL 20 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption			Temperature °F (°C)			
			gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—656 rpm)									
	61.46 *(45.83)*	2200	3.814 *(14.438)*	0.435 *(0.265)*	16.11 *(3.174)*	187 *(86.3)*	63 *(17.3)*	75 *(23.9)*	28.823 *(97.332)*
Standard Power take-off Speed (540 rpm)—One Hour									
	54.25 *(40.45)*	1813 –	3.326 *(12.590)*	0.430 *(0.261)*	16.31 *(3.213)*	195 *(90.5)*	63 *(17.2)*	75 *(24.1)*	28.835 *(97.371)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	53.42 *(39.84)*	2249	3.253 *(12.314)*	0.427 *(0.260)*	16.42 *(3.235)*	181 *(82.8)*	63 *(17.2)*	76 *(24.4)*	....
	0.00 *(0.00)*	2424	1.040 *(3.937)*	....	....	177 *(80.6)*	63 *(17.2)*	76 *(24.2)*	....
	27.70 *(20.66)*	2335	2.051 *(7.764)*	0.519 *(0.316)*	13.51 *(2.661)*	179 *(81.7)*	63 *(17.2)*	76 *(24.2)*	....
	62.04 *(46.26)*	2200	3.844 *(14.551)*	0.434 *(0.264)*	16.14 *(3.179)*	185 *(85.0)*	63 *(17.2)*	76 *(24.2)*	....
	14.11 *(10.52)*	2378	1.511 *(5.720)*	0.751 *(0.457)*	9.34 *(1.839)*	177 *(80.6)*	63 *(17.2)*	76 *(24.4)*	....
	40.95 *(30.54)*	2300	2.616 *(9.903)*	0.448 *(0.272)*	15.66 *(3.084)*	181 *(82.8)*	64 *(17.5)*	77 *(25.0)*	....
Av ***Av***	**33.04** ***(24.64)***	**2314**	**2.386** ***(9.032)***	**0.506** ***(0.308)***	**13.85** ***(2.728)***	**180** ***(82.2)***	**63** ***(17.3)***	**76** ***(24.4)***	**28.827** ***(97.343)***

DRAWBAR PERFORMANCE (Front Wheel Drive Disengaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F (°C)			
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 18th (3HH) Gear											
51.53 *(38.43)*	3186 *(14.17)*	6.06 *(9.76)*	2200	6.05	3.746 *(14.179)*	0.509 *(0.310)*	13.76 *(2.710)*	185 *(84.7)*	65 *(18.3)*	75 *(23.9)*	28.315 *(97.304)*
75% of Pull at Maximum Power—Ten Hours 18th (3HH) Gear											
40.71 *(30.36)*	2402 *(10.68)*	6.36 *(10.23)*	2261	4.24	3.018 *(11.424)*	0.520 *(0.316)*	13.49 *(2.657)*	184 *(84.2)*	71 *(21.7)*	85 *(29.2)*	28.494 *(96.220)*
50% of Pull at Maximum Power—Two Hours 18th (3HH) Gear											
28.22 *(21.04)*	1600 *(7.12)*	6.61 *(10.64)*	2318	2.85	2.337 *(8.845)*	0.580 *(0.353)*	12.08 *(2.379)*	183 *(83.6)*	77 *(24.7)*	86 *(30.0)*	28.455 *(96.088)*
50% of Pull at Reduced Engine Speed—Two Hours 19th (4HH) Gear											
28.24 *(21.06)*	1604 *(7.13)*	6.60 *(10.63)*	1492	2.79	2.016 *(7.630)*	0.500 *(0.304)*	14.01 *(2.760)*	184 *(84.4)*	78 *(25.6)*	91 *(32.5)*	28.455 *(96.088)*

MAXIMUM POWER IN SELECTED GEARS

43.96 *(32.78)*	4695 *(20.89)*	3.51 *(5.65)*	2247	14.96	16th (1HH) Gear		183 *(83.9)*	64 *(17.8)*	71 *(21.7)*	28.810 *(97.287)*
49.26 *(36.73)*	4570 *(20.33)*	4.04 *(6.51)*	2199	12.79	17th (2HH) Gear		186 *(85.6)*	74 *(23.3)*	82 *(27.8)*	28.450 *(96.070)*
51.63 *(38.50)*	3201 *(14.24)*	6.05 *(9.73)*	2198	6.30	18th (3HH) Gear		186 *(85.3)*	70 *(21.1)*	77 *(25.0)*	28.480 *(96.173)*
50.21 *(37.44)*	1949 *(8.67)*	9.66 *(15.54)*	2199	3.59	19th (4HH) Gear		187 *(86.1)*	74 *(23.3)*	83 *(28.3)*	28.450 *(96.071)*

LUGGING ABILITY IN 18th (3HH) GEAR

Crankshaft Speed rpm	2198	1981	1760	1542	1318	1098
Pull—lbs *(kN)*	3201 *(14.24)*	3362 *(14.96)*	3448 *(15.34)*	3462 *(15.40)*	3498 *(15.56)*	3417 *(15.20)*
Increase in Pull %	0	5	8	8	9	7
Power—Hp *(kW)*	51.63 *(38.50)*	48.64 *(36.27)*	44.18 *(32.95)*	38.89 *(29.00)*	33.54 *(25.01)*	27.36 *(20.40)*
Speed—Mph *(km/h)*	6.05 *(9.73)*	5.42 *(8.73)*	4.80 *(7.73)*	4.21 *(6.78)*	3.60 *(5.79)*	3.00 *(4.83)*
Slip %	6.30	6.74	6.99	6.99	6.99	6.74

Department of Agricultural Engineering

Detes of Test: June 2-11, 1981

Manufacturer: ISEKI AND CO., LTD., Tokyo, Japan

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8417 **Fuel weight** 7.008 lbs/gal *(0.840 kg/l)* **Oil** White Farm Equipment Turbo Diesel Oil **SAE** 30 **API service classification** SD-SE/CC-CD **To motor** 2.162 gal *(8.184 l)* **Drained from motor** 2.055 gal *(7.779 l)* **Transmission and final drive lubricant** White Farm Equipment Co. Universal tractor hydraulic transmission fluid **Total time engine was operated** 37.5 hours

ENGINE: Make ISUZU Diesel **Model** 4BB1 **Type** four cylinder vertical **Serial No.** 505944 **Crankshaft** lengthwise **Rated rpm** 2200 **Bore and stroke** 4.016" × 4.33" *(102 mm × 110 mm)* **Compression ratio** 17.5 to 1 **Displacement** 219 cu in *(3595 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements **Oil filter** one paper element **Fuel filter** two paper elements and sediment bowl with screen **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type front wheel assist **Serial No.** 00486K **Tread width** rear 55.5" *(1410 mm)* to 79.1" *(2010 mm)* front 59" *(1500 mm)* **Wheel base** 84.4" *(2145 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 36.9" *(938 mm)* Vertical distance above roadway 33.7" *(855 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph** ***(km/h)*** first 0.2 *(0.3)* second 0.2 *(0.3)* third 0.3 *(0.4)* fourth 0.4 *(0.7)* fifth 0.7 *(1.1)* sixth 0.7 *(1.2)* seventh 0.8 *(1.4)* eighth 0.9 *(1.5)* ninth 1.1 *(1.8)* tenth 1.2 *(1.9)* eleventh 1.5 *(2.4)* twelfth 1.8 *(2.9)* thirteenth 2.3 *(3.7)* fourteenth 2.9 *(4.7)* fifteenth 3.6 *(5.8)* sixteenth 3.9 *(6.3)* seventeenth 4.4 *(7.1)* eighteenth 6.2 *(10.0)* nineteenth 9.6 *(15.4)* twentieth 15.3 *(24.6)* reverse 0.3 *(0.5)*, 1.3 *(2.1)*, 1.6 *(2.6)*, 6.7 *(10.8)* **Clutch** single dry disc operated by foot pedal **Brakes** multiple wet disc operated by two foot pedals which can be locked together and hand lever **Steering** power assist **Turning radius** (on concrete surface with brake applied) right 126" *(3.20 m)* left 126" *(3.20 m)* (on concrete surface without brake) right 146" *(3.70 m)* left 146" *(3.70 m)* **Turning space diameter** (on concrete surface with brake applied) right 260" *(6.60 m)* left 260" *(6.60 m)* (on concrete surface without brake) right 307" *(7.80 m)* left 307" *(7.80 m)* **Power take-off** 540 rpm at 1813 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)	Front Wheel Drive Disengaged dB(A)
Maximum Available Power—Two Hours	93.5	93.5
75% of Pull at Maximum Power—Ten Hours		93.0
50% of Pull at Maximum Power—Two Hours		91.5
50% of Pull at Reduced Engine Speed—Two Hours		90.0
Bystander in 20th (5HH) gear		83.0

DRAWBAR PERFORMANCE
(Front Wheel Drive Engaged)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	Fuel Consumption lb/hp.hr *(kg/kW.h)*	Fuel Consumption Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cooling med	Temp. °F *(°C)* Air wet bulb	Temp. °F *(°C)* Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 18th (3HH) Gear											
50.92 *(37.97)*	3090 *(13.75)*	6.18 *(9.94)*	2200	4.16	3.657 *(13.841)*	0.503 *(0.306)*	13.92 *(2.743)*	187 *(85.3)*	61 *(15.8)*	82 *(27.5)*	28.840 *(97.388)*
MAXIMUM POWER IN SELECTED GEARS											
43.35 *(32.33)*	6201 *(27.58)*	2.62 *(4.22)*	2252	14.98	14th (5LH) Gear			182 *(83.3)*	62 *(16.7)*	67 *(19.4)*	28.800 *(97.253)*
51.96 *(38.75)*	3159 *(14.05)*	6.17 *(9.93)*	2199	4.36	18th (3HH) Gear			187 *(86.1)*	72 *(22.2)*	80 *(26.7)*	28.460 *(96.105)*

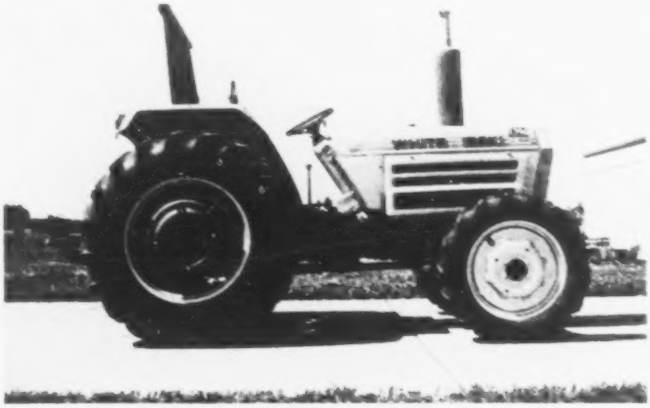
TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 16.9-30; 6; 16 *(110)*	Two 16.9-30; 6; 16 *(110)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	275 lb *(125 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 9.5-24; 8; 22 *(150)*	Two 9.5-24; 8; 22 *(150)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	42 lb *(19 kg)*	None
Height of drawbar		20 in *(510 mm)*	20 in *(510 mm)*
Static Weight with Operator	—Rear	4190 lb *(1901 kg)*	3640 lb *(1651 kg)*
	Front	2685 lb *(1218 kg)*	2600 lb *(1179 kg)*
	Total	6875 lb *(3119 kg)*	6240 lb *(2830 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 157°F *(69.6°C)*. Four gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1396**.

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers



White-Iseki 2-62 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1397 — ALLIS CHALMERS 6060 DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

	Power Hp (kW)	Crank shaft speed rpm	Fuel Consumption gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temperature °F (°C) Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg (kPa)
MAXIMUM POWER AND FUEL CONSUMPTION									
Rated Engine Speed—Two Hours (PTO Speed—558 rpm)									
	63.83 *(47.60)*	2300	4.035 *(15.274)*	0.443 *(0.270)*	15.82 *(3.116)*	183 *(84.1)*	o5 *(18.6)*	75 *(23.7)*	28.823 *(97.332)*
Standard Power take-off Speed (540 rpm)—One Hour									
	64.90 *(48.40)*	2226	3.992 *(15.111)*	0.431 *(0.262)*	16.26 *(3.203)*	184 *(84.3)*	66 *(18.9)*	75 *(23.9)*	28.775 *(97.169)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours									
	57.56 *(42.92)*	2440	3.915 *(14.820)*	0.477 *(0.290)*	14.70 *(2.896)*	180 *(81.9)*	66 *(18.9)*	75 *(23.9)*	....
	0.00 *(0.00)*	2542	1.421 *(5.379)*	....	....	170 *(76.7)*	67 *(19.4)*	76 *(24.2)*	....
	29.47 *(21.98)*	2499	2.674 *(10.122)*	0.636 *(0.387)*	11.02 *(2.172)*	176 *(80.0)*	67 *(19.4)*	76 *(24.2)*	....
	63.98 *(47.71)*	2300	4.035 *(15.274)*	0.442 *(0.269)*	15.86 *(3.124)*	184 *(84.4)*	67 *(19.4)*	75 *(23.9)*	....
	14.87 *(11.09)*	2521	2.011 *(7.612)*	0.948 *(0.577)*	7.39 *(1.457)*	171 *(77.2)*	67 *(19.2)*	75 *(23.9)*	....
	43.76 *(32.63)*	2472	3.312 *(12.537)*	0.531 *(0.323)*	13.21 *(2.603)*	179 *(81.7)*	66 *(18.9)*	75 *(23.9)*	....
Av ***Av***	**34.94** ***(26.05)***	**2462**	**2.895** ***(10.959)***	**0.581** ***(0.353)***	**12.07** ***(2.377)***	**177** ***(80.3)***	**67** ***(19.2)***	**75** ***(24.0)***	**28.813** ***(97.298)***

DRAWBAR PERFORMANCE

Power Hp (kW)	Drawbar pull lbs (kN)	Speed mph (km/h)	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr (l/h)	lb/hp.hr (kg/kW.h)	Hp.hr/gal (kW.h/l)	Temp. °F (°C) Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg (kPa)
Maximum Available Power—Two Hours 5th (1-H) Gear											
50.87 *(37.93)*	3949 *(17.57)*	4.83 *(7.77)*	2298	6.28	3.833 *(14.510)*	0.528 *(0.321)*	13.27 *(2.614)*	185 *(84.7)*	60 *(15.6)*	81 *(27.2)*	28.935 *(97.709)*
75% of Pull at Maximum Power—Ten Hours 5th (1-H) Gear											
42.67 *(31.82)*	3041 *(13.53)*	5.25 *(8.47)*	2453	4.32	3.559 *(13.471)*	0.585 *(0.356)*	11.99 *(2.362)*	182 *(83.4)*	61 *(16.1)*	79 *(26.1)*	28.803 *(97.263)*
50% of Pull at Maximum Power—Two Hours 5th (1-H) Gear											
29.34 *(21.88)*	2031 *(9.03)*	5.42 *(8.72)*	2489	2.83	2.906 *(11.001)*	0.694 *(0.422)*	10.10 *(1.989)*	178 *(81.1)*	63 *(17.2)*	75 *(23.9)*	28.810 *(97.287)*
50% of Pull at Reduced Engine Speed—Two Hours 6th (2-H) Gear											
29.42 *(21.93)*	2031 *(9.03)*	5.43 *(8.74)*	1729	2.72	2.157 *(8.166)*	0.514 *(0.313)*	13.63 *(2.686)*	180 *(81.9)*	63 *(17.2)*	80 *(26.7)*	28.810 *(97.287)*
MAXIMUM POWER IN SELECTED GEARS											
34.39 *(25.64)*	6846 *(30.45)*	1.88 *(3.03)*	2468	14.94	2nd (2-L) Gear			178 *(80.8)*	61 *(16.1)*	71 *(21.7)*	28.800 *(97.253)*
47.57 *(35.48)*	6662 *(29.63)*	2.68 *(4.31)*	2299	12.99	3rd (3-L) Gear			181 *(82.5)*	60 *(15.6)*	67 *(19.4)*	28.770 *(97.152)*
50.23 *(37.46)*	5179 *(23.04)*	3.64 *(5.85)*	2300	8.63	4th (4-L) Gear			185 *(84.7)*	58 *(14.4)*	76 *(24.4)*	28.950 *(97.760)*
52.24 *(38.96)*	4054 *(18.03)*	4.83 *(7.78)*	2300	6.32	5th (1-H) Gear			185 *(85.0)*	58 *(14.4)*	75 *(23.9)*	28.960 *(97.794)*
51.83 *(38.65)*	2722 *(12.11)*	7.14 *(11.49)*	2300	3.88	6th (2-H) Gear			184 *(84.4)*	58 *(14.4)*	77 *(25.0)*	28.940 *(97.726)*

LUGGING ABILITY IN 5th (1-H) GEAR

Crankshaft Speed rpm	2300	2072	1844	1611	1384	1150
Pull—lbs *(kN)*	4054 *(8.03)*	5013 *(22.30)*	5241 *(23.32)*	5458 *(24.28)*	5467 *(24.32)*	5075 *(22.57)*
Increase in Pull %	0	24	29	35	35	25
Power—Hp *(kW)*	2.24 *(3.96)*	57.05 *(42.55)*	52.74 *(39.33)*	47.62 *(35.51)*	40.89 *(30.49)*	31.90 *(23.79)*
Speed—Mph *(km/h)*	4.83 *(7.78)*	4.27 *(6.87)*	3.77 *(6.07)*	3.27 *(5.27)*	2.80 *(4.51)*	2.36 *(3.79)*
Slip %	6.32	8.13	8.63	9.38	9.63	8.51

Department of Agricultural Engineering

Dates of Test: June 9-22, 1981

Manufacturer: ALLIS CHALMERS CORPORATION, P.O. Box 512, Milwaukee, Wisconsin 53201

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8420 **Fuel weight** 7.011 lbs/gal *(0.840 kg/l)* **Oil SAE** 15W40 **API service classification** SE-CD **To motor** 2.498 gal *(9.456 l)* **Drained from motor** 2.297 gal *(8.695 l)* **Transmission and final drive lubricant** A. C. Power Fluid 821 **Total time engine was operated** 37.5 hours

ENGINE: Make Allis Chalmers Diesel **Type** four cylinder vertical with turbocharger **Serial No.** 33-09171 **Crankshaft** lengthwise **Rated rpm** 2300 **Bore and stroke** 3.876" × 4.250" *(98.4 mm × 107.9 mm)* **Compression ratio** 14.1 to 1 **Displacement** 200 cu in *(3287 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** one paper element with centrifugal precleaner **Oil filter** one full flow cartridge **Oil cooler** engine coolant heat exchanger for crankcase oil **Fuel filter** one paper cartridge **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: Type standard **Serial No.** 6060 1336 **Tread width** rear 56.9" *(1445 mm)* to 88.9" *(2258 mm)* front 56" *(1422 mm)* to 79" *(2006 mm)* **Wheel base** 92.6" *(2352 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 30.6" *(778 mm)* Vertical distance above roadway 34.8" *(883 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.5 *(2.4)* second 2.1 *(3.4)* third 3.2 *(5.1)* fourth 4.1 *(6.6)* fifth 5.4 *(8.6)* sixth 7.7 *(12.4)* seventh 11.5 *(18.5)* eighth 14.9 *(23.9)* reverse 1.9 *(3.0)*, 6.9 *(11.1)* **Clutch** dry single disc operated by foot pedal **Brakes** multiple wet disc hydraulically operated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 131.5" *(3.34 m)* left 135.0" *(3.43 m)* (on concrete surface without brake) right 146.0" *(3.71 m)* left 149.7" *(3.80 m)* **Turning space diameter** (on concrete surface with brake applied) right 278.0" *(7.06 m)* left 286.0" *(7.26 m)* (on concrete surface without brake) right 307.0" *(7.80 m)* left 314.5" *(7.99 m)* **Power take-off** 540 rpm at 2226 engine rpm

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	92.0
75% of Pull at Maximum Power—Ten Hours	91.0
50% of Pull at Maximum Power—Two Hours	91.0
50% of Pull at Reduced Engine Speed—Two Hours	88.5
Bystander in 8th (4-H) gear	85.5

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 15.5-38, 6; 18 *(125)*	Two 15.5-38; 6; 18 *(125)*
Ballast	—Liquid (each)	638 lb *(289 kg)*	None
	—Cast Iron (each)	550 lb *(249 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 7.50-16, 6; 36 *(250)*	Two 7.50-16, 6, 36 *(250)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	52 lb *(24 kg)*	None
Height of Drawbar		20.5 in *(520 mm)*	20.5 in *(520 mm)*
Static Weight with Operator	—Rear	6700 lb *(3039 kg)*	4325 lb *(1962 kg)*
	Front	2245 lb *(1018 kg)*	2140 lb *(971 kg)*
	Total	8945 lb *(4057 kg)*	6465 lb *(2933 kg)*

procedure. Temperature at injection pump return was 136°F *(57.6°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1397.**

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

Allis Chalmers 6060 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1398 — ALLIS CHALMERS 6080 DIESEL 12 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption			Temperature °F *(°C)*			Barometer inch Hg *(kPa)*
		gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cooling medium	Air wet bulb	Air dry bulb	
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—955 rpm)								
83.66 *(62.39)*	2300	5.016 *(18.988)*	0.420 *(0.256)*	16.68 *(3.286)*	188 *(86.4)*	66 *(18.9)*	75 *(23.9)*	28.767 *(97.141)*
Standard Power take-off Speed (1000 rpm)—One Hour								
74.49 *(55.53)*	2408	4.745 *(17.962)*	0.447 *(0.272)*	15.70 *(3.093)*	184 *(84.3)*	66 *(18.8)*	75 *(23.9)*	28.795 *(97.236)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
74.43 *(55.50)*	2408	4.737 *(17.931)*	0.446 *(0.271)*	15.71 *(3.095)*	184 *(84.4)*	66 *(18.9)*	75 *(23.6)*	....
0.00 *(0.00)*	2567	1.532 *(5.799)*	....	....	174 *(78.9)*	65 *(18.3)*	75 *(23.6)*	....
38.69 *(28.85)*	2500	3.222 *(12.197)*	0.584 *(0.355)*	12.01 *(2.365)*	180 *(82.2)*	65 *(18.3)*	75 *(23.9)*	....
83.83 *(62.51)*	2300	5.002 *(18.935)*	0.418 *(0.255)*	16.76 *(3.301)*	187 *(86.1)*	66 *(18.9)*	75 *(23.9)*	....
19.59 *(14.61)*	2536	2.345 *(8.877)*	0.839 *(0.511)*	8.35 *(1.646)*	175 *(79.4)*	66 *(18.9)*	75 *(23.9)*	....
57.03 *(42.53)*	2460	3.979 *(15.062)*	0.489 *(0.298)*	14.33 *(2.824)*	182 *(83.3)*	66 *(18.9)*	77 *(24.7)*	....
Av 45.60 ***Av (34.00)***	**2462**	**3.470** ***(13.135)***	**0.534** ***(0.325)***	**13.14** ***(2.589)***	**180** ***(82.4)***	**66** ***(18.7)***	**75** ***(23.9)***	**28.817** ***(97.310)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption			Temp. °F *(°C)*			Barom. inch Hg *(kPa)*
					gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Cool-ing med	Air wet bulb	Air dry bulb	
Maximum Available Power—Two Hours 8th (4-I) Gear											
70.50 *(52.57)*	4609 *(20.50)*	5.74 *(9.23)*	2301	5.30	4.939 *(18.695)*	0.491 *(0.299)*	14.27 *(2.812)*	189 *(87.2)*	62 *(16.4)*	77 *(25.0)*	28.790 *(97.220)*
75% of Pull at Maximum Power—Ten Hours 8th (4-I) Gear											
57.00 *(42.50)*	3469 *(15.43)*	6.16 *(9.91)*	2429	3.70	4.450 *(16.846)*	0.547 *(0.333)*	12.81 *(2.523)*	184 *(84.7)*	57 *(13.9)*	71 *(21.9)*	29.069 *(98.162)*
50% of Pull at Maximum Power—Two Hours 8th (4-I) Gear											
39.37 *(29.36)*	2326 *(10.35)*	6.35 *(10.21)*	2478	2.69	3.601 *(13.633)*	0.641 *(0.390)*	10.93 *(2.153)*	184 *(84.4)*	66 *(18.6)*	85 *(29.2)*	28.745 *(97.068)*
50% of Pull at Reduced Engine Speed—Two Hours 9th (1-H) Gear											
39.29 *(29.30)*	2319 *(10.32)*	6.35 *(10.22)*	1734	2.58	2.657 *(10.056)*	0.474 *(0.288)*	14.79 *(2.913)*	185 *(84.7)*	66 *(18.6)*	90 *(31.9)*	28.725 *(97.000)*
MAXIMUM POWER IN SELECTED GEARS											
62.72 *(46.77)*	9003 *(40.05)*	2.61 *(4.20)*	2377	14.92	5th (1-I) Gear			183 *(83.9)*	55 *(12.8)*	64 *(17.8)*	28.900 *(97.591)*
68.93 *(51.40)*	7386 *(32.85)*	3.50 *(5.63)*	2300	9.66	6th (2-I) Gear			187 *(85.8)*	60 *(15.6)*	71 *(21.7)*	28.850 *(97.422)*
70.65 *(52.68)*	5852 *(26.03)*	4.53 *(7.29)*	2302	6.55	7th (3-I) Gear			188 *(86.4)*	59 *(15.0)*	70 *(21.1)*	28.860 *(97.456)*
72.32 *(53.93)*	4725 *(21.02)*	5.74 *(9.24)*	2302	5.37	8th (4-I) Gear			184 *(84.4)*	56 *(13.3)*	68 *(20.0)*	28.920 *(97.659)*
71.80 *(53.54)*	3218 *(14.32)*	8.37 *(13.46)*	2298	3.28	9th (1-H) Gear			187 *(86.1)*	60 *(15.6)*	68 *(20.0)*	28.870 *(97.490)*

LUGGING ABILITY IN 8th (4-I) GEAR

Crankshaft Speed rpm	2302	2070	1836	1612	1386	1152
Pull—lbs *(kN)*	4725 *(21.02)*	5317 *(23.65)*	5755 *(25.60)*	6000 *(26.69)*	5942 *(26.43)*	5072 *(22.56)*
Increase in Pull %	0	13	22	27	26	7
Power—Hp *(kW)*	72.32 *(53.93)*	72.64 *(54.17)*	69.32 *(51.69)*	63.26 *(47.17)*	53.88 *(40.18)*	38.65 *(28.82)*
Speed—Mph *(km/h)*	5.74 *(9.24)*	5.12 *(8.25)*	4.52 *(7.27)*	3.95 *(6.36)*	3.40 *(5.47)*	2.86 *(4.60)*
Slip %	5.37	5.99	6.55	6.82	6.82	5.86

Department of Agricultural Engineering

Dates of Test: June 8-20, 1981

Manufacturer: ALLIS CHALMERS CORPORATION, P.O. Box 512, Milwaukee, Wisconsin 53201

FUEL, OIL AND TIME: **Fuel** No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8420 **Fuel weight** 7.011 lbs/gal *(0.840 kg/l)* **Oil SAE** 15W40 **API service classification** SE-CD **To motor** 2.529 gal *(9.573 l)* **Drained from motor** 2.691 gal *(10.187 l)* **Transmission and final drive lubricant** A. C. Power Fluid 821 **Total time engine was operated** 40.0 hours

ENGINE: **Make** Allis Chalmers Diesel **Type** four cylinder vertical with turbocharger and intercooler **Serial No.** 33-05899 **Crankshaft** lengthwise **Rated rpm** 2300 **Bore and stroke** 3.876" × 4.25" *(98.4 mm × 107.9 mm)* **Compression ratio** 14.1 to 1 **Displacement** 200 cu in *(3287 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** one paper element with centrifugal precleaner **Oil filter** one full flow cartridge **Oil cooler** engine coolant heat exchanger for crankcase oil **Fuel filter** one paper cartridge **Muffler** vertical **Cooling medium temperature control** one thermostat.

CHASSIS: **Type** standard **Serial No.** 6080 1265 **Tread width** rear 60.6" *(1538 mm)* to 84.6" *(2148 mm)* front 60" *(1524 mm)* to 88" *(2235 mm)* **Wheel base** 96" *(2438 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from centerline of rear wheels 29.3" *(744 mm)* Vertical distance above roadway 35.4" *(899 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.0 *(1.6)* second 1.4 *(2.2)* third 1.7 *(2.7)* fourth 2.1 *(3.4)* fifth 3.0 *(4.9)* sixth 4.0 *(6.4)* seventh 5.0 *(8.0)* eighth 6.2 *(10.0)* ninth 8.8 *(14.2)* tenth 11.5 *(18.6)* eleventh 14.4 *(23.2)* twelfth 18.0 *(29.0)* reverse 1.0 *(1.6)*, 2.9 *(4.6)*, 8.4 *(13.4)* **Clutch** single dry disc operated by foot pedal **Brakes** multiple wet disc hydraulically operated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 143" *(3.63 m)* left 145" *(3.68 m)* (on concrete surface without brake) right 155" *(3.94 m)* left 157" *(3.98 m)* **Turning space diameter** (on concrete surface with brake applied) right 304" *(7.72 m)* left 307" *(7.81 m)* (on concrete surface without brake) right 328" *(8.34 m)* left 331" *(8.41 m)* **Power take-off** 1000 rpm at 2408 engine rpm and 540 rpm at 2124 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	93.0
75% of Pull at Maximum Power—Ten Hours	92.0
50% of Pull at Maximum Power—Two Hours	91.0
50% of Pull at Reduced Engine Speed—Two Hours	89.0
Bystander in 12th (4-H) gear	86.0

TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Two 18.4-34; 8; 18 *(125)*	Two 18.4-34; 8; 18 *(125)*
Ballast	—Liquid (each)	1048 lb *(475 kg)*	None
	—Cast Iron (each)	1000 lb *(454 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 7.50-16; 6; 36 *(250)*	Two 7.50-16; 6; 36 *(250)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	52 lb *(24 kg)*	None
Height of Drawbar		19.5 in *(495 mm)*	19.5 in *(495 mm)*
Static Weight with Operator	—Rear	9365 lb *(4248 kg)*	5270 lb *(2391 kg)*
	Front	2425 lb *(1100 kg)*	2320 lb *(1052 kg)*
	Total	11790 lb *(5348 kg)*	7590 lb *(3443 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump return was 144°F *(62.0°C)*. Five gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1398.**

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers

Allis Chalmers 6080 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1399 — MASSEY FERGUSON MF 2805 DIESEL 8 SPEED

POWER TAKE-OFF PERFORMANCE

Power Hp *(kW)*	Crank shaft speed rpm	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temperature °F (°C) Cooling medium	Air wet bulb	Air dry bulb	Barometer inch Hg *(kPa)*
MAXIMUM POWER AND FUEL CONSUMPTION								
Rated Engine Speed—Two Hours (PTO Speed—1196 rpm)								
190.81 *(142.29)*	2500	12.991 *(49.176)*	0.477 *(0.290)*	14.69 *(2.893)*	189 *(87.4)*	59 *(15.1)*	75 *(23.8)*	28.920 *(97.659)*
Standard Power take-off Speed (1000 rpm)—One Hour								
186.29 *(138.92)*	2091	11.227 *(42.499)*	0.422 *(0.257)*	16.59 *(3.269)*	190 *(87.6)*	60 *(15.3)*	75 *(23.8)*	28.920 *(97.659)*
VARYING POWER AND FUEL CONSUMPTION—Two Hours								
168.69 *(125.79)*	2600	12.357 *(46.776)*	0.513 *(0.312)*	13.65 *(2.689)*	187 *(86.1)*	60 *(15.3)*	75 *(23.9)*	....
0.00 *(0.00)*	2784	5.081 *(19.234)*	....	....	178 *(81.1)*	59 *(15.0)*	74 *(23.3)*	....
87.81 *(65.48)*	2706	8.732 *(33.054)*	0.697 *(0.424)*	10.06 *(1.981)*	185 *(84.7)*	60 *(15.6)*	75 *(23.9)*	....
191.71 *(142.96)*	2500	13.059 *(49.434)*	0.477 *(0.290)*	14.68 *(2.892)*	191 *(88.1)*	60 *(15.6)*	76 *(24.2)*	....
44.27 *(33.01)*	2738	6.853 *(25.941)*	1.085 *(0.660)*	6.46 *(1.273)*	182 *(83.1)*	60 *(15.6)*	75 *(23.9)*	....
129.37 *(96.47)*	2662	10.589 *(40.084)*	0.574 *(0.349)*	12.22 *(2.407)*	186 *(85.6)*	60 *(15.6)*	75 *(23.9)*	....
Av 103.64 **Av *(77.28)***	**2665**	**9.445** ***(35.753)***	**0.639** ***(0.389)***	**10.97** ***(2.161)***	**185** ***(84.8)***	**60** ***(15.4)***	**75** ***(23.8)***	**28.910** ***(97.625)***

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F (°C) Cooling med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 5th Gear											
160.48 *(119.67)*	11124 *(49.48)*	5.41 *(8.71)*	2499	6.73	12.930 *(48.945)*	0.565 *(0.344)*	12.41 *(2.445)*	194 *(90.0)*	60 *(15.6)*	81 *(26.9)*	28.930 *(97.692)*
75% of Pull at Maximum Power—Ten Hours 5th Gear											
131.84 *(98.32)*	8555 *(38.05)*	5.78 *(9.30)*	2613	4.68	11.539 *(43.679)*	0.613 *(0.373)*	11.43 *(2.251)*	195 *(90.7)*	74 *(23.3)*	87 *(30.4)*	28.806 *(97.274)*
50% of Pull at Maximum Power—Two Hours 5th Gear											
91.58 *(68.29)*	5717 *(25.43)*	6.01 *(9.67)*	2674	3.08	9.559 *(36.185)*	0.732 *(0.445)*	9.58 *(1.887)*	187 *(86.1)*	63 *(17.2)*	86 *(29.7)*	28.935 *(97.709)*
50% of Pull at Reduced Engine Speed—Two Hours 6th Gear											
91.53 *(68.25)*	5701 *(25.36)*	6.02 *(9.69)*	1932	3.08	7.134 *(27.004)*	0.546 *(0.332)*	12.83 *(2.527)*	188 *(86.7)*	65 *(18.1)*	88 *(30.8)*	28.930 *(97.692)*
MAXIMUM POWER IN SELECTED GEARS											
146.88 *(109.53)*	17647 *(78.50)*	3.12 *(5.02)*	2591	14.63	3rd Gear			189 *(86.9)*	71 *(21.7)*	79 *(26.1)*	28.830 *(97.355)*
163.66 *(122.04)*	13286 *(59.10)*	4.62 *(7.43)*	2500	8.03	4th Gear			192 *(88.6)*	59 *(15.0)*	76 *(24.4)*	28.900 *(97.591)*
164.58 *(122.73)*	11397 *(50.70)*	5.41 *(8.71)*	2499	6.54	5th Gear			191 *(88.3)*	59 *(15.0)*	73 *(22.8)*	28.890 *(97.557)*
164.36 *(122.57)*	8032 *(35.73)*	7.67 *(12.35)*	2501	4.45	6th Gear			192 *(88.6)*	59 *(15.0)*	77 *(25.0)*	28.920 *(97.659)*

LUGGING ABILITY IN 5th GEAR

Crankshaft Speed rpm	2499	2254	1998	1746	1491	1247
Pull—lbs *(kN)*	11397 *(50.70)*	12669 *(56.35)*	13594 *(60.47)*	14155 *(62.96)*	14166 *(63.01)*	13375 *(59.50)*
Increase in Pull %	0	11	19	24	24	17
Power—Hp *(kW)*	164.58 *(122.73)*	163.44 *(121.87)*	154.17 *(114.96)*	139.39 *(103.95)*	118.90 *(88.66)*	94.58 *(70.52)*
Speed—Mph *(km/h)*	5.41 *(8.71)*	4.84 *(7.79)*	4.25 *(6.84)*	3.69 *(5.94)*	3.15 *(5.07)*	2.65 *(4.27)*
Slip %	6.54	7.44	8.17	8.76	9.04	8.32

Department of Agricultural Engineering

Dates of Test: June 18-24, 1981

Manufacturer: MASSEY FERGUSON, INC.,
1901 Bell Avenue, Des Moines, Iowa 50315

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60° *(15°/15°)*** 0.8418 **Fuel weight** 7.009 lbs/gal *(0.840 kg/l)* **Oil SAE** 20-20W **API service classification** SB/SE-CA/CD **To motor** 5.393 gal *(20.415 l)* **Drained from motor** 4.924 gal *(18.639 l)* **Transmission and final drive lubricant** Massey Ferguson Permatran fluid **Total time engine was operated** 32.5 hours.

ENGINE: Make Perkins Diesel **Type** eight cylinder vee with turbocharger **Serial No.** ZB31068U512277G **Crankshaft** lengthwise **Rated rpm** 2500 **Bore and stroke** 4.63" × 4.75" *(117.6 mm × 120.6 mm)* **Compression ratio** 15 to 1 **Displacement** 640 cu in *(10484 ml)* **Starting system** 12 volt **Lubrication** pressure **Air cleaner** two paper elements with aspirator **Oil filter** two full flow cartridges **Oil cooler** engine coolant heat exchanger for crankcase oil, radiator for hydraulic and transmission oil **Fuel filter** two paper cartridges **Muffler** vertical **Cooling medium temperature control** four thermostats.

CHASSIS: Type standard with duals **Serial No.** 9R010458 **Tread width** rear 71" *(1803 mm)* to 126" *(3200 mm)* front 63" *(1600 mm)* to 83" *(2110 mm)* **Wheel base** 110" *(2794 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 35.9" *(912 mm)* Vertical distance above roadway 40.6" *(1031 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio **Advertised speeds mph *(km/h)*** first 1.7 *(2.7)* second 2.4 *(3.9)* third 3.4 *(5.5)* fourth 4.9 *(7.9)* fifth 5.7 *(9.2)* sixth 7.9 *(12.7)* seventh 11.5 *(18.5)* eighth 16.4 *(26.4)* reverse 2.0 *(3.2)*, 2.8 *(4.5)*, 4.0 *(6.4)*, 5.8 *(9.3)*, 6.6 *(10.6)*, 9.2 *(14.8)* **Clutch** double dry disc operated by foot pedal **Brakes** single wet disc hydraulically power actuated and operated by two foot pedals which can be locked together **Steering** hydrostatic **Turning radius** (on concrete surface with brake applied) right 152" *(3.86 m)* left 152" *(3.86 m)* (on concrete surface without brake) right 202" *(5.13 m)* left 202" *(5.13 m)* **Turning space diameter** (on concrete surface with brake applied) right 330" *(8.38 m)* left 330" *(8.38 m)* (on concrete surface without brake) right 428" *(10.87 m)* left 428" *(10.87 m)* **Power take-off** 1000 rpm at 2091 engine rpm.

REPAIRS and ADJUSTMENTS: No repairs or adjustments.

TRACTOR SOUND LEVEL WITHOUT CAB	dB(A)
Maximum Available Power—Two Hours	99.0
75% of Pull at Maximum Power—Ten Hours	100.5
50% of Pull at Maximum Power—Two Hours	100.0
50% of Pull at Reduced Engine Speed—Two Hours	95.5
Bystander in 8th gear	92.5

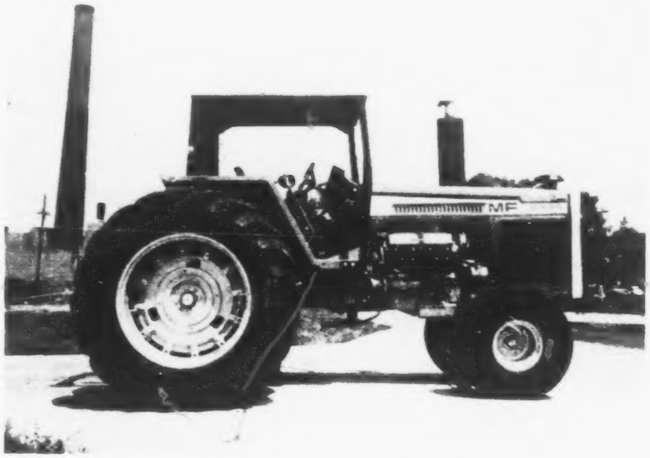
TIRES, BALLAST AND WEIGHT		With Ballast	Without Ballast
Rear Tires	—No., size, ply & psi *(kPa)*	Four 20.8-38; 10; 14 *(95)*	Four 20.8-38; 10; 14 *(95)*
Ballast	—Liquid (each inner)	1088 lb *(493 kg)*	None
	—Cast Iron (each inner)	1570 lb *(712 kg)*	None
Front Tires	—No., size, ply & psi *(kPa)*	Two 16.5L-16.1; 8; 32 *(220)*	Two 16.5L-16.1; 8; 32 *(220)*
Ballast	—Liquid (each)	None	None
	—Cast Iron (each)	40 lb *(18 kg)*	None
Height of Drawbar		21 in *(535 mm)*	21 in *(535 mm)*
Static Weight with Operator	—Rear	16370 lb *(7425 kg)*	11055 lb *(5014 kg)*
	Front	5060 lb *(2295 kg)*	4980 lb *(2259 kg)*
	Total	21430 lb *(9720 kg)*	16035 lb *(7273 kg)*

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump return was 162°F *(72.2°C)*. Four gears were chosen between 15% slip and 10 mph *(16.1 km/h)*.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1399.**

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
L. L. BASHFORD
Board of Tractor Test Engineers



Massey Ferguson MF 2805 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

NEBRASKA TRACTOR TEST 1400 — BIG BUD 525/50 DIESEL 9 SPEED

DRAWBAR PERFORMANCE

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Fuel Consumption gal/hr *(l/h)*	lb/hp.hr *(kg/kW.h)*	Hp.hr/gal *(kW.h/l)*	Temp. °F *(°C)* Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
Maximum Available Power—Two Hours 3rd (L3) Gear											
406.48 *(303.11)*	26984 *(120.03)*	5.65 *(9.09)*	2100	4.04	27.340 *(103.493)*	0.471 *(0.287)*	14.87 *(2.929)*	179 *(81.4)*	73 *(22.8)*	84 *(28.9)*	28.930 *(97.692)*
75% of Pull at Maximum Power—Ten Hours 3rd (L3) Gear											
345.77 *(257.84)*	21462 *(95.47)*	6.04 *(9.72)*	2223	3.06	24.750 *(93.690)*	0.502 *(0.305)*	13.97 *(2.752)*	177 *(80.6)*	71 *(21.9)*	86 *(29.8)*	28.885 *(97.540)*
50% of Pull at Maximum Power—Two Hours 3rd (L3) Gear											
232.40 *(173.30)*	13995 *(62.25)*	6.23 *(10.02)*	2267	2.01	19.350 *(73.248)*	0.584 *(0.355)*	12.01 *(2.366)*	173 *(78.1)*	73 *(22.8)*	81 *(26.9)*	28.890 *(97.557)*
50% of Pull at Reduced Engine Speed—Two Hours 5th (L5) Gear											
233.97 *(174.47)*	14049 *(62.49)*	6.25 *(10.05)*	1652	1.93	15.605 *(59.071)*	0.467 *(0.284)*	14.99 *(2.954)*	173 *(78.3)*	75 *(23.9)*	88 *(31.1)*	28.875 *(97.507)*

MAXIMUM POWER IN SELECTED GEARS

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Gear	Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
399.17 *(297.66)*	42216 *(187.79)*	3.55 *(5.71)*	2099	9.20	1st (L1) Gear	178 *(81.1)*	72 *(22.2)*	85 *(29.4)*	28.920 *(97.659)*
413.44 *(308.30)*	35554 *(158.15)*	4.36 *(7.02)*	2101	5.72	2nd (L2) Gear	178 *(81.1)*	72 *(22.2)*	85 *(29.4)*	28.930 *(97.692)*
421.49 *(314.30)*	28011 *(124.60)*	5.64 *(9.08)*	2097	4.16	3rd (L3) Gear	179 *(81.7)*	73 *(22.8)*	85 *(29.4)*	28.930 *(97.692)*
419.34 *(312.70)*	23303 *(103.66)*	6.75 *(10.86)*	2100	3.28	4th (L4) Gear	179 *(81.4)*	71 *(21.7)*	85 *(29.4)*	28.920 *(97.659)*
418.20 *(311.85)*	19919 *(88.60)*	7.87 *(12.67)*	2100	2.63	5th (L5) Gear	179 *(81.7)*	71 *(21.7)*	85 *(29.4)*	28.910 *(97.625)*
416.39 *(310.50)*	16655 *(74.08)*	9.38 *(15.09)*	2099	2.30	6th (L6) Gear	179 *(81.7)*	72 *(22.2)*	86 *(30.0)*	28.910 *(97.625)*

MAXIMUM PULL IN 3rd (L3) GEAR (TORQUE CONVERTER MODE)

Power Hp *(kW)*	Drawbar pull lbs *(kN)*	Speed mph *(km/h)*	Crank-shaft speed rpm	Slip %	Gear	Cool-ing med	Air wet bulb	Air dry bulb	Barom. inch Hg *(kPa)*
301.93 *(225.15)*	44927 *(199.85)*	2.52 *(4.06)*	2077	14.75	3rd (L3) Gear	182 *(83.1)*	74 *(23.3)*	83 *(28.3)*	28.890 *(97.557)*

LUGGING ABILITY IN 3rd (L3) GEAR

Crankshaft Speed rpm	2097	1886	1684	1467	2113	2087
Pull—lbs *(kN)*	28011 *(124.60)*	31071 *(138.21)*	33963 *(151.08)*	35054 *(155.93)*	38360 *(170.63)*	43377 *(192.95)*
Increase in Pull %	0	11	21	25	37	55
Power—Hp *(kW)*	421.49 *(314.30)*	417.75 *(311.51)*	404.56 *(301.68)*	362.25 *(270.36)*	344.70 *(257.04)*	323.73 *(241.41)*
Speed—Mph *(km/h)*	5.64 *(9.08)*	5.04 *(8.11)*	4.47 *(7.19)*	3.88 *(6.24)*	3.37 *(5.42)*	2.80 *(4.50)*
Slip %	4.16	4.63	5.41	5.72	6.78	10.67

TRACTOR SOUND LEVEL W/CAB	**dB(A)**
Maximum Available Power—Two Hours	74.0
75% of Pull at Maximum Power—Ten Hours	74.5
50% of Pull at Maximum Power—Two Hours	75.5
50% of Pull at Reduced Engine Speed—Two Hours	74.0
Bystander in 6th (L6) gear	94.0

TIRES, BALLAST AND WEIGHT		**Tested Without Ballast**
Rear Tires	—No., size, ply & psi *(kPa)*	Four 30.5L-32; 10; inner 14 *(95)* outer 12 *(85)*
Ballast	—Liquid (each)	None
	—Cast Iron (each)	None
Front Tires	—No., size, ply & psi *(kPa)*	Four 30.5L-32; 10; inner 16 *(110)* outer 14 *(95)*
Ballast	—Liquid (each)	None
	—Cast Iron (each)	None
Height of Drawbar		17.5 in *(445 mm)*
Static Weight with Operator	—Rear	21260 lb *(9644 kg)*
	Front	30660 lb *(13907 kg)*
	Total	51920 lb *(23551 kg)*

Department of Agricultural Engineering

Dates of Test: June 29 to July 9, 1981.

Manufacturer: BIG BUD TRACTORS, INC., Box 1111, Havre, Montana 59501

FUEL, OIL AND TIME: Fuel No. 2 Diesel **Cetane No.** 46.3 (rating taken from oil company's inspection data) **Specific gravity converted to 60°/60°** *(15°/15°)* 0.8418 **Fuel weight** 7.009 lbs/gal *(0.840 kg/l)* **Oil SAE** 15W-40 **API service classification** SB/SE-CA/CD **To motor** 8.760 gal *(33.160 l)* **Drained from motor** 7.567 gal *(28.644 l)* **Transmission lubricant** SAE 10 hydraulic transmission oil **Hydraulic oil** Union ISO VG 46 or equivalent **Final drive lubricant** SAE 80W-140 **Total time engine was operated** 36.0 hours.

ENGINE: Make Cummins Diesel **Type** six cylinder vertical with turbocharger and intercooler **Serial No.** 31121666 **Crankshaft** lengthwise **Rated rpm** 2100 **Bore and stroke** 6.25" × 6.25" *(158.8 mm × 158.8 mm)* **Compression ratio** 15.5 to 1 **Displacement** 1150 cu in *(18845 ml)* **Starting system** 24 volt **Lubrication** pressure **Air cleaner** two paper elements with aspirator **Air compressor** direct engine drive **Oil filter** two full flow cartridges and one bypass element **Oil cooler** engine coolant heat exchangers for crankcase and torque converter oil **Fuel filter** two paper cartridges **Muffler** vertical **Cooling medium temperature control** two thermostats.

CHASSIS: Type four wheel drive with duals **Serial No.** CT35C30511157 **Tread width** rear 91" *(2310 mm)* to 159.5" *(4050 mm)* front 91" *(2310 mm)* to 159.5" *(4050 mm)* **Wheel base** 150" *(3810 mm)* **Center of gravity** (without operator or ballast, with minimum tread, with fuel tank filled and tractor serviced for operation) Horizontal distance forward from center-line of rear wheels 88.5" *(2250 mm)* Vertical distance above roadway 47.5" *(1205 mm)* Horizontal distance from center of rear wheel tread 0" *(0 mm)* to the right/left **Hydraulic control system** direct engine drive **Transmission** selective gear fixed ratio 6 range power shift with torque converter and automatic lockup **Advertised speeds mph** ***(km/h)*** first 3.8 *(6.1)* second 4.5 *(7.2)* third 5.7 *(9.2)* fourth 6.8 *(10.9)* fifth 7.9 *(12.6)* sixth 9.3 *(15.0)* seventh 9.8 *(15.7)* eighth 14.7 *(23.7)* ninth 20.2 *(32.6)* reverse 3.8 *(6.1)*, 9.8 *(15.7)* **Clutch** none **Brakes** expanding shoe pneumatically operated by foot pedal **Steering** hydrostatic and articulated **Turning radius** (on concrete surface without brake) right 325" *(8.26 m)* left 325" *(8.26 m)* **Turning space diameter** (on concrete surface without brake) right 680" *(17.28 m)* left 680" *(17.28 m)* **Power take-off** none.

REPAIRS and ADJUSTMENTS: During the limber up period, the hydraulic steering suction line came in contact with the drive line and wore through. It was replaced and secured.

REMARKS: All test results were determined from observed data obtained in accordance with SAE and ASAE test code or official Nebraska test procedure. Temperature at injection pump was 134°F *(56.7°C)*. Six gears were chosen between 15% slip and 10 mph *(16.1 km/h)*. The transmission shifted to torque converter mode after the third step of the lugging run, resulting in increased engine speed.

We, the undersigned, certify that this is a true and correct report of official Tractor Test No. **1400.**

LOUIS I. LEVITICUS
Engineer-in-Charge

K. VON BARGEN
W. E. SPLINTER
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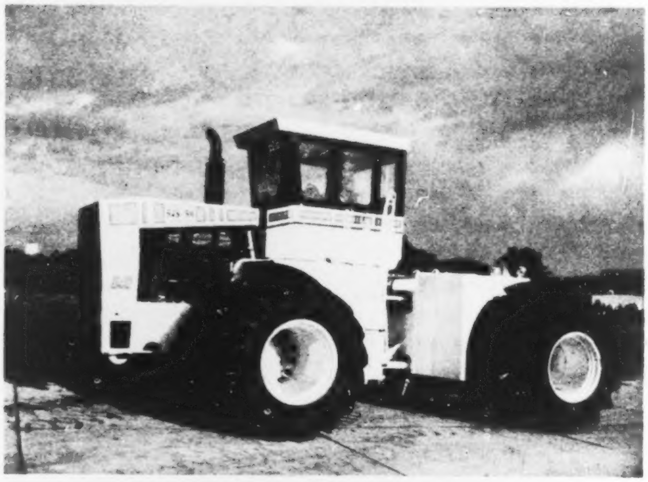
Board of Tractor Test Engineers



Big Bud 525/50 Diesel

The Agricultural Experiment Station
Institute of Agriculture and Natural Resources
University of Nebraska–Lincoln
Roy G. Arnold, Director

Nebraska Tractor Tests Summarized (Tests from 1972 through 1981)

						ENGINE									—FUEL CONSUMPTION (HP Hours Per Gallon) @:—				
																	—Varying Drawbar Power—		
MAKE AND MODEL OF TRACTOR	Test No.	Fuel Used	Weight With Ballast	Lbs. Ballast Carried	No. of Cyl-inders	Bore and Stroke	Dis-place-ment Cu. in.	Rated RPM Dwbr.	Max. PTO HP @ Rated Engine RPM	Std. PTO RPM	Max. PTO HP @ Std. PTO RPM	Max. Draw-bar HP	MPH @ Max. Dwbr. HP	Max. Lbs. Pull	Max. PTO HP @ Std. PTO RPM	PTO Average @ Varying Power	Max. Avail-able Power	75% of Pull Max. Power	50% of Pull @ Max. Power
Allis-Chalmers																			
175	1156	Gas.	8400	2010	4	4.000x4.500	226	1800	60.88	540	56.02	53.17	5.50	6875	11.78	9.44	10.22	9.64	8.20
5020	1270	Die.	3358	1298	2	3.62x3.74	77	2500	21.79	540	20.78	18.05	5.74	2346	13.99	10.99	11.07	10.51	8.62
5030	1271	Die.	3876	1346	2	3.82x3.94	90.1	2500	26.42	540	25.61	23.92	4.26	3389	13.82	11.28	11.64	11.48	9.68
5040	1230	Die.	6240	2180	3	3.740x4.330	143	2400	40.05	540	36.69	35.86	5.00	4837	15.47	11.80	12.58	12.74	10.44
5050 Diesel	1240	Die.	7690	3280	3	4.055x4.330	168	2700	51.46	540	47.16	45.22	5.68	6075	16.10	12.42	12.58	13.01	11.24
6060 8 Speed	1397	Die.	8945	2480	4	3.876x4.250	200	2300	63.83	540	64.90	52.24	4.83	6846	16.26	12.07	13.27	11.99	10.10
6080 12 Speed	1398	Die.	11790	4200	4	3.876x4.25	200	2300	83.66	1000	74.49	72.32	5.74	9003	15.70	13.14	14.27	12.81	10.93
7000PS Diesel	1195	Die.	12580	3030	6	3.875x4.250	301	2200	106.44	1000	105.85	92.64	6.08	9907	15.70	12.21	13.21	12.27	10.16
7010PD Die. 20 Speed	1345	Die.	12790	1530	6	3.875x4.25	301	2300	106.53	1000	107.52	91.44	6.05	9426	15.48	11.57	12.59	11.48	9.68
7010PS Die. 12 Speed	1346	Die.	12740	1365	6	3.875x4.25	301	2300	106.72	1000	106.33	91.61	6.11	9516	15.43	11.74	12.43	11.35	9.58
7020 Power Shift	1259	Die.	15610	3840	6	3.875x4.250	301	2300	123.79	1000	123.50	105.36	6.59	12001	16.01	12.45	13.10	12.25	10.34
7020 Power Director	1260	Die.	15655	4085	6	3.875x4.250	301	2300	123.85	1000	125.51	107.36	6.63	11964	16.08	12.12	13.09	12.08	10.13
7030 Diesel	1119	Die.	16560	4130	6	4.250x5.000	426	2300	130.98	1000	131.14	113.28	4.94	12610	15.45	11.76	12.92	11.90	9.91
7040 Diesel	1166	Die.	17380	5585	6	4.250x5.000	426	2300	136.49	1000	136.26	117.12	4.77	13619	15.35	11.78	12.94	11.86	9.80
7040PS Diesel	1196	Die.	17355	4977	6	4.250x5.000	426	2300	136.30	1000	136.15	117.75	4.61	13547	15.51	11.95	13.05	12.29	10.39
7045 Power Director	1261	Die.	18980	4745	6	4.250x5.000	426	2300	146.18	1000	146.46	127.84	7.04	15430	14.62	11.26	12.16	11.40	9.72
7045 Powershift Diesel	1308	Die.	18990	4390	6	4.25x5.00	426	2300	146.88	1000	146.67	127.61	6.92	15449	14.92	11.32	12.58	11.71	9.62
7050 Diesel	1120	Die.	19530	5005	6	4.250x5.000	426	2300	156.49	1000	156.63	135.11	5.47	16206	16.04	12.69	13.47	12.67	10.53
7060 Diesel	1167	Die.	20490	6500	6	4.250x5.000	426	2300	161.51	1000	160.44	140.59	6.94	17370	15.99	12.71	13.63	12.75	10.55
7060PS Diesel	1197	Die.	20560	5915	6	4.250x5.000	426	2300	161.42	1000	161.65	144.13	4.92	17851	16.08	12.76	13.80	12.98	10.79
7080 Diesel	1168	Die.	21720	7115	6	4.250x5.000	426	2550	181.51	996	181.51	153.78	4.58	18478	15.71	12.24	13.23	12.11	10.02
7580 4WD	1229	Die.	25000	1490	6	4.250x5.000	426	2550	186.35	996	186.35	160.79	6.91	23310	14.81	11.47	12.22	11.39	9.40
8550 Diesel	1262	Die.	29360	2320	6	5.250x5.625	731	2500	253.88	998	253.88	224.18	5.83	26220	14.57	10.94	12.47	11.45	9.35
Belarus																			
MTZ 80 Diesel	1139	Die.	11575	3735	4	4.331x4.921	290	2200	74.79	1000	73.88	65.64	5.08	8141	15.30	13.07	13.12	13.12	11.32
250 Diesel	1183	Die.	5490	939	2	4.134x4.724	127	1800	24.95	540	25.02	21.81	4.54	2280	15.56	13.23	13.19	13.20	11.80
T25A Diesel	1200	Die.	5490	939	2	4.134x4.724	127	1800	28.70	540	28.15	24.46	4.51	2570	13.95	13.46	12.21	13.48	11.94
1500 Diesel 12 Speed	1333	Die.	19885	1120	6	5.118x4.528	558	2100	168.76	1000	169.63	151.96	5.31	19311	16.48	13.69	14.53	13.98	12.25
7100 Diesel 16 Speed	1334	Die.	32460	None	12	5.118x5.512	1360	1900	269.62	1003	269.62	259.46	4.78	30845	15.85	13.26	14.82	14.35	12.56
Big Bud																			
525/50 9 Speed	1400	Die.	---------	--------	6	6.25x6.25	1150	2100	DNA	DNA	DNA	421.49	5.64	42216	DNA	DNA	14.87	13.97	12.01
David Brown																			
885 Gasoline	1143	Gas.	6550	2530	3	3.939x4.000	146.1	2200	39.26	1000†	37.26	32.92	4.61	5308	10.96	8.19	7.55	7.00	7.21
855 Diesel	1137	Die.	6480	2125	3	3.939x4.500	164.4	2200	43.20	1000†	40.87	37.16	4.57	5135	16.61	14.03	13.85	13.73	12.67
990 Diesel	1144	Die.	9350	4690	4	3.939x4.000	194.9	2200	53.77	1000†	50.48	46.34	5.54	7335	15.53	13.23	13.37	12.91	11.14
995 Diesel	1136	Die.	9475	4325	4	3.939x4.500	219	2200	58.77	1000†	55.33	50.42	5.44	7317	16.60	13.94	13.78	13.60	12.40
1210 Diesel	1142	Die.	10440	4640	4	3.939x4.500	219	2300	65.98	1000†	59.40	57.23	6.16	8097	16.40	14.43	13.61	14.36	12.93
1212 Diesel	1138	Die.	10435	4030	4	3.939x4.500	219	2300	65.36	1000†	58.25	54.10	6.92	8137	15.35	13.84	12.56	13.27	11.82
Case																			
870 Manual Diesel	1149	Die.	13510	3435	4	4.625x5.000	336	2100	80.20	1000	77.93	71.09	5.23	10047	14.52	12.13	12.42	12.53	10.88
870 Power Shift	1150	Die.	13760	3665	4	4.625x5.000	336	2100	80.49	1000	76.52	71.04	4.39	10030	13.64	11.60	11.49	12.04	10.60
1190 Manual	1378	Die.	6780	2160	3	3.939x4.500	165	2200	43.09	540	38.54	36.60	7.60	4620	14.99	13.09	12.22	12.59	11.39
1270	1103	Die.	17625	4185	6	4.375x5.000	451	2100	126.70	1000	126.60	109.77	6.79	12690	14.52	11.05	12.13	11.55	9.81
1270	1160	Die.	18910	3440	6	4.375x5.000	451	2100	135.39	1000	135.41	121.83	6.46	15648	14.23	11.14	12.16	11.49	9.88
1290 Manual	1379	Die.	9320	2750	4	3.939x4.000	195	2200	53.73	540	47.80	46.41	4.97	6851	15.20	13.34	12.41	12.90	11.68
1370	1102	Die.	20960	5670	6	4.625x5.000	504	2100	142.51	1000	143.64	123.01	4.78	16609	15.37	11.45	12.73	11.82	10.16
1370 Diesel	1148	Die.	20290	4945	6	4.625x5.000	504	2200	155.56	1000	156.32	134.25	5.00	16480	15.01	10.95	12.04	10.91	9.11
1390 Manual	1380	Die.	9780	3160	4	3.939x4.500	219	2200	60.59	1000	58.40	52.16	4.92	7348	15.58	13.36	12.89	13.24	11.77
1410 Manual	1209	Die.	10910	3160	4	3.939x4.500	219	2300	80.88	540	79.35	69.25	5.32	7846	17.47	14.69	14.20	14.38	12.45

1410 Power Shift	1210	Die.	10990	3150	4	3.939x4.500	219	2300	80.61	540	76.21	67.98	7.90	7815	16.86	13.76	13.34	13.21	11.45
1490 Manual	1381	Die.	11305	3600	4	3.939x4.500	219	2200	70.51	1000	68.75	60.45	5.63	8340	17.18	13.62	13.82	13.00	11.25
1490 Powershift	1382	Die.	11060	2635	4	3.939x4.500	219	2200	70.91	1000	70.48	61.56	6.76	8405	16.42	12.36	13.12	12.01	10.20
1570	1218	Die.	20350	4060	6	4.625x5.000	504	2100	180.41	1003	180.41	152.96	5.02	17115	15.09	12.47	12.72	12.46	10.88
1690 Manual (1)	1383	Die.	12470	3715	6	3.939x4.500	329	2300	90.39	1000	87.76	78.08	4.27	10536	15.95	13.95	13.20	13.50	12.28
2090 Manual Diesel	1304	Die.	15030	3120	6	4.625x5.000	504	2100	108.74	998	108.74	95.31	7.10	11655	15.40	12.23	13.41	12.69	10.73
2090 Power Shift	1295	Die.	15190	3160	6	4.625x5.00	504	2100	108.29	998	108.29	93.95	6.56	11211	14.94	11.77	12.49	11.96	10.14
2290 Manual Diesel	1296	Die.	15400	2630	6	4.625x5.000	504	2100	128.80	998	128.80	109.36	5.32	12635	14.52	11.66	12.46	11.73	10.07
2290 Powershift Diesel	1297	Die.	15840	2140	6	4.625x5.000	504	2100	129.08	998	129.08	111.68	6.25	12749	14.52	11.53	12.65	11.37	9.77
2390 Powershift Diesel	1302	Die.	18710	3120	6	4.625x5.000	504	2100	160.72	1002	160.72	146.01	6.59	16020	15.23	12.41	13.20	12.66	10.99
2470	1114	Die.	20485	None	6	4.625x5.000	504	2200	174.20	1008	174.20	154.24	5.67	18050	15.22	12.31	13.30	12.55	10.86
2590 Powershift Diesel	1303	Die.	20500	4760	6	4.625x5.000	504	2100	180.38	1003	180.38	159.01	6.57	17865	15.53	12.97	13.42	13.03	11.67
2670 Diesel	1165	Die.	25260	4450	6	4.625x5.000	504	2200	219.44	1008	219.44	194.60	5.28	23618	15.29	12.59	13.42	12.60	10.88
2870 Diesel	1241	Die.	28150	3050	6	5.000x5.710	673	2200	252.10	1009	252.10	219.61	5.72	26386	15.45	12.01	12.98	12.37	10.40
M-B 4/94	1211	Die.	13110	4620	6	3.819x5.039	346	2550	73.33	1000†	70.17	66.33	5.33	10558	15.13	10.68	12.55	11.65	9.49
4490 Diesel	1328	Die.	22450	1610	6	4.625x5.000	504	2200	175.20	1000	175.20	153.30	5.65	21400	15.27	12.36	13.30	12.52	10.87
4690 Diesel	1329	Die.	25230	2920	6	4.625x5.000	504	2200	219.62	1000	219.62	195.60	5.97	24564	15.26	12.76	13.39	12.84	11.21
4890 Diesel	1330	Die.	28460	2710	6	5.00x5.71	673	2200	253.41	1000	253.41	224.81	5.96	27627	16.32	13.02	14.19	13.27	11.36

(1) With mechanical front wheel drive.

John Deere

830 Diesel	1146	Die.	5714	1338	3	3.860x4.330	152	2400	35.30	540	32.62	28.46	5.19	4252	14.74	11.37	11.84	11.03	9.09
850	1280	Die.	3528	992	3	3.15x3.35	78	2600	22.27	540	20.66	18.92	4.90	2699	14.26	11.51	11.23	11.22	10.21
950	1281	Die.	3615	803	3	3.54x3.54	105	2400	27.36	540	28.05	23.46	4.98	3056	14.68	12.36	12.42	12.23	10.63
1050 Diesel	1327	Die.	4140	730	3	3.54x3.54	105	2400	33.41	540	33.42	28.15	5.27	3466	15.46	12.36	12.34	11.99	10.13
1530 Diesel	1147	Die.	6863	1909	3	4.020x4.330	164	2500	45.38	540	41.36	38.86	5.58	5139	14.28	11.20	12.04	11.47	9.78
2040 Diesel	1191	Die.	6420	1620	3	4.020x4.330	164	2500	40.86	540	37.62	34.15	5.64	4634	15.50	11.18	11.87	11.15	9.51
2040 Diesel 8 Speed	1350	Die.	6500	1465	3	4.19x4.33	179	2500	41.25	540	40.53	33.31	5.63	4873	15.62	11.73	12.02	11.35	9.03
2040 8 Speed TSS (1)	1393	Die.	6040	265	3	4.19x4.33	179	2500	40.44	540	40.22	33.21	5.16	5541	14.87	10.93	11.69	10.71	8.76
2240 Diesel	1192	Die.	7340	2390	3	4.190x4.330	179	2500	50.37	540	46.78	41.28	5.54	5433	15.20	11.08	11.57	11.18	9.51
2240 8 Speed TSS (1)	1394	Die.	6205	310	3	4.19x4.33	179	2500	50.90	540	49.20	42.13	5.08	5777	15.32	11.75	11.98	11.45	9.78
2630	1157	Die.	8430	2630	4	4.190x5.000	276	2500	70.37	540	69.02	58.15	5.38	6470	16.01	10.89	12.10	10.98	8.95
2840 Diesel	1249	Die.	10500	1695	6	4.020x4.330	329	2500	80.65	1000	76.27	67.47	6.21	8386	16.02	11.52	12.36	11.57	9.59
2940 Diesel 16 Speed	1351	Die.	10650	1215	6	4.19x4.33	359	2500	81.17	1000	81.46	67.98	4.64	7601	15.91	11.73	12.81	11.91	9.91
4030 Quad-Range	1111	Die.	10150	970	6	4.02x4.330	329	2500	80.33	1000	77.72	68.76	6.10	7512	15.40	10.69	11.71	10.99	8.92
4040 Diesel	1267	Die.	12055	1165	6	4.250x4.750	404	2200	90.80	1002	90.80	77.85	6.36	8936	13.49	10.59	11.24	10.96	9.21
4040 Syncro Range	1359	Die.	12090	1600	6	4.25x4.75	404	2200	90.31	1002	90.31	77.04	8.14	9035	13.87	10.85	11.68	11.29	9.70
4040 Power Shift	1360	Die.	12080	1590	6	4.25x4.75	404	2200	90.79	1000	90.88	78.54	4.45	9195	13.54	10.79	11.50	11.35	9.55
4230 Quad-Range	1112	Die.	14150	3250	6	4.250x4.750	404	2200	100.32	1002	100.32	86.36	6.65	11116	14.10	11.61	12.02	11.92	10.10
4240 Diesel	1266	Die.	14090	1695	6	4.5625x4.75	466	2200	110.94	1002	110.94	95.18	5.42	11492	14.33	11.09	12.05	11.35	9.52
4240 Syncro Range	1361	Die.	14240	2430	6	4.56x4.75	466	2200	110.81	1002	110.81	95.40	4.90	12240	14.17	11.08	12.00	11.47	9.81
4240 Power Shift	1362	Die.	14260	2440	6	4.56x4.75	466	2200	111.06	1000	111.43	95.65	4.51	12450	14.39	11.25	12.13	11.65	10.13
4430 Quad-Range	1110	Die.	15060	3710	6	4.250x4.750	404	2200	125.88	1002	125.88	108.46	6.58	12032	15.56	12.00	12.94	11.96	10.17
4440 Diesel	1265	Die.	15540	2270	6	4.5625x4.75	466	2200	130.58	1002	130.58	112.56	5.02	13392	15.21	11.73	12.69	11.83	9.90
4440 Pwr Shift	1357	Die.	15775	2656	6	4.56x4.75	466	2200	130.41	1010	130.41	114.16	4.53	13738	15.32	11.83	13.15	12.22	10.60
4630 Power Shift	1113	Die.	16250	None	6	4.250x4.750	404	2200	150.66	995	150.66	134.56	10.26	14478	15.68	12.43	13.34	12.28	10.59
4640 Diesel	1264	Die.	18120	None	6	4.5625x4.75	466	2200	156.30	995	156.30	134.70	6.45	15362	15.61	12.29	13.30	12.15	10.32
4640 Power Shift	1358	Die.	18585	2804	6	4.56x4.75	466	2200	155.96	1000	157.01	137.04	4.81	15989	15.87	12.17	13.53	12.55	10.78
4840 Diesel	1263	Die.	20370	2240	6	4.5625x4.75	466	2200	180.63	1000	181.63	157.09	4.76	17307	15.85	12.47	13.35	12.54	10.76
6030	1100	Die.	18180	None	6	4.750x5.000	531	2100	175.99	1024	175.99	155.42	6.65	15303	15.82	12.70	13.52	12.72	11.04
7520	1101	Die.	22320	None	6	4.750x5.000	531	2100	175.82	1005	175.82	165.21	5.69	22517	15.18	12.37	13.76	12.82	10.97
8430 Diesel	1179	Die.	23100	290	6	4.563x4.750	466	2100	178.16	993	178.16	160.39	5.56	22503	15.12	11.98	13.44	12.64	10.72
8440 Diesel	1323	Die.	26590	None	6	4.563x4.75	466	2100	179.83	993	179.83	163.26	4.97	25383	15.86	12.55	14.29	13.06	11.25
8630 Diesel	1180	Die.	26480	1950	6	5.125x5.000	619	2100	225.59	993	225.59	202.31	4.58	26443	15.34	12.27	13.67	12.80	10.78
8640 Diesel	1324	Die.	28270	None	6	5.125x5.00	619	2100	228.75	993	228.75	208.38	4.63	27782	15.61	12.40	14.06	13.14	11.16

(1) With mechanical front wheel drive.

Deutz

D4506	1131	Die.	7390	2880	3	3.940x4.720	172.5	2300	43.15	540	42.17	37.07	4.68	5472	18.01	14.12	14.49	14.05	12.46
5506	1104	Die.	9780	4490	4	3.940x4.720	230	2300	56.08	540	52.88	48.84	3.84	6996	17.77	13.84	14.37	13.69	12.06
6006	1091	Die.	11250	4920	4	3.940x4.720	230	2300	66.25	1000	63.93	58.15	7.02	8623	15.26	13.53	13.02	13.64	11.75
D6206	1219	Die.	8780	3410	4	3.937x4.724	230	2050	60.23	540	57.00	52.41	6.04	6944	17.58	15.43	15.10	15.34	14.05
D6806	1220	Die.	11000	4605	4	3.937x4.724	230	2300	68.18	540	62.52	61.87	7.15	9095	16.55	14.73	14.63	15.05	13.52
10006	1105	Die.	14440	6060	6	3.940x4.720	345	2400	105.04	1000	101.19	91.13	9.50	9979	14.39	13.46	12.14	13.52	11.70

Nebraska Tractor Tests Summarized (Tests from 1972 through 1981)

					ENGINE										—FUEL CONSUMPTION (HP Hours Per Gallon) @:—				
																PTO	—Varying Drawbar Power—		
MAKE AND MODEL OF TRACTOR	Test No.	Fuel Used	Weight With Ballast	Lbs. Ballast Carried	No. of Cyl-inders	Bore and Stroke	Dis-place-ment Cu. in.	Rated RPM Dwbr.	Max. PTO HP @ Rated Engine RPM	Std. PTO RPM	Max. PTO HP @ Std. PTO RPM	Max. Draw-bar HP	MPH @ Max. Dwbr. HP	Max. Lbs. Pull	Max. PTO HP @ Std. PTO RPM	Average @ Varying Power	Max. Avail-able Power	75% of Pull Max. Power	50% of Pull @ Max. Power
Deutz Cont.																			
13006	1092	Die.	15980	6375	6	3.940x4.720	345	2400	125.71	1000	133.27	114.85	8.47	10677	17.39	14.10	14.36	13.87	12.07
D13006	1130	Die.	16125	4075	6	3.940x4.720	345	2400	125.77	1000	126.19	110.24	5.74	13509	17.71	14.00	14.97	13.83	11.95
DX-90 Diesel	1305	Die.	13150	3210	5	3.94x4.72	287	2300	84.47	1000	80.82	74.19	6.53	8786	16.45	14.15	13.81	14.07	12.39
DX-110 Diesel	1306	Die.	14940	2360	6	3.94x4.72	345	2300	100.29	1000	93.61	90.82	7.00	11773	15.10	13.71	13.52	14.03	12.60
DX-160 Diesel	1307	Die.	18710	3870	6	4.02x4.92	374	2200	145.41	1000	140.99	124.81	6.41	15172	17.82	14.47	14.56	13.95	11.93
Fiat																			
420	1293	Die.	6035	2115	3	3.74x4.33	143	2200	41.34	540	37.45	37.71	5.65	5299	14.81	12.93	13.30	13.92	12.35
580	1292	Die.	9210	2580	3	4.055x4.33	168	2700	51.61	540	48.42	44.20	3.38	8899	14.93	12.59	12.14	12.70	10.50
780	1294	Die.	10230	2830	4	4.055x4.33	224	2500	70.36	540	66.30	64.43	4.06	7776	15.41	13.62	13.93	14.17	12.50
Ford																			
1600 Diesel	1228	Die.	3840	1150	2	3.543x3.937	77.6	2500	23.02	540	19.78	18.53	5.76	2634	14.14	11.82	11.26	11.45	9.72
1700 Diesel	1325	Die.	3725	1110	2	3.54x3.94	77.6	2500	23.26	540	23.02	20.21	5.54	2801	13.02	11.21	10.82	11.48	10.41
1900 Diesel	1326	Die.	4160	1225	3	3.35x3.31	87.2	2800	26.88	540	25.68	23.49	6.20	2964	12.58	10.38	10.41	10.89	9.32
2600 6-Speed	1204	Die.	5990	1550	3	4.200x3.800	158	2000	32.38	540	30.51	27.93	5.57	4591	14.88	11.51	12.27	11.74	10.22
2600 6-Speed	1206	Gas.	6000	1645	3	4.200x3.800	158	2000	32.78	540	31.03	28.25	5.57	4198	11.14	7.89	8.83	8.17	6.73
2600 8-Speed	1222	Die.	6000	460	3	4.200x3.800	158	2000	32.47	540	30.76	28.18	5.56	4452	14.62	11.18	11.94	11.22	9.18
2600 8-Speed	1207	Gas.	6000	1710	3	4.200x3.800	158	2000	34.18	540	32.07	30.20	5.49	4455	11.54	8.38	9.45	8.64	7.15
3600 6-Speed	1203	Die.	6860	2445	3	4.200x4.200	175	2000	40.49	540	37.64	34.47	5.96	5114	15.32	12.12	12.84	12.34	9.97
3600 6-Speed	1208	Gas.	6900	2665	3	4.200x4.200	175	2000	40.17	540	37.91	35.53	5.91	5158	11.23	8.07	9.29	8.77	7.05
3600 8-Speed	1221	Die.	6890	1300	3	4.200x4.200	175	2000	40.55	540	38.31	34.10	5.96	5277	15.33	12.40	12.93	12.51	10.36
3600 8-Speed	1226	Gas.	6900	1500	3	4.200x4.200	175	2000	40.62	540	38.29	35.90	5.93	5123	11.42	8.16	9.02	8.57	6.88
4100 8-Speed	1202	Die.	7500	2590	3	4.200x4.400	183	2000	45.46	540	41.13	41.14	4.63	5557	15.59	11.57	12.57	11.96	10.36
4600 8-Speed	1223	Die.	8220	2340	3	4.400x4.400	201	2200	52.44	540	46.31	45.57	5.24	6342	14.59	11.49	11.82	11.85	10.77
5600 8-Speed	1201	Die.	9690	3785	4	4.200x4.200	233	2100	60.46	540	56.85	52.22	5.49	7105	15.77	12.83	12.87	12.88	11.02
5600 16-Speed	1227	Die.	9690	2380	4	4.200x4.200	233	2100	58.46	540	56.00	49.79	5.36	7140	15.06	11.94	12.07	11.94	10.42
6600 8-Speed	1217	Die.	9660	3780	4	4.400x4.200	256	2100	70.56	1000	70.07	61.36	6.91	7131	15.43	12.86	12.28	12.71	11.35
6600 16-Speed	1224	Die.	9700	2680	4	4.400x4.200	256	2100	68.10	1000	68.05	58.74	5.22	7267	14.97	12.64	12.05	12.77	11.05
6700 16-Speed	1244	Die.	9690	1180	4	4.400x4.200	255	2100	68.94	1000	68.62	58.06	7.55	6787	13.77	12.23	11.24	12.38	11.16
7000	1093	Die.	10795	4580	4	4.400x4.200	256	2100	83.49	540	78.81	71.42	5.71	8138	16.64	13.53	13.21	12.86	11.51
7600 16-Speed	1225	Die.	10760	3320	4	4.400x4.200	256	2100	84.79	1000	85.16	67.95	5.61	7779	15.95	12.35	12.44	11.77	9.92
7700 16-Speed	1242	Die.	10800	2400	4	4.400x4.200	255	2100	84.38	1000	84.29	71.57	7.28	7688	15.24	11.65	11.92	11.21	9.71
8700 16-Speed	1245	Die.	14760	2490	6	4.400x4.400	401	2300	110.58	1000	99.56	100.12	6.94	11581	15.02	11.91	12.37	12.28	10.93
8600 Dual Power	1121	Die.	14790	3360	6	4.400x4.400	401	2300	110.69	1000	99.32	93.26	4.88	11363	15.69	12.84	12.71	12.74	11.19
9600 Dual Power	1122	Die.	18000	6140	6	4.400x4.400	401	2200	135.46	1000	128.46	116.40	6.65	12203	16.88	12.99	13.31	12.64	11.06
9700 16-Speed	1243	Die.	17480	4620	6	4.40x4.400	401	2200	135.64	1000	129.25	118.08	6.55	15010	15.95	11.77	12.63	11.97	10.34
TW-10 Diesel	1301	Die.	15190	2325	6	4.4x4.4	401	2300	110.24	1000	101.09	97.35	5.23	12006	14.86	11.50	12.17	11.91	10.20
TW-20 Diesel	1300	Die.	17180	3945	6	4.4x4.4	401	2200	135.60	1000	131.43	121.47	7.85	14155	16.22	11.78	13.08	12.04	10.09
TW-30 Diesel	1299	Die.	19830	5205	6	4.4x4.4	401	2200	163.28	1000	157.04	144.17	8.32	16553	16.76	12.49	13.67	12.58	10.79
FW-20	1291	Die.	31000	1385	8	4.625x4.125	555	2850	....	....	....	156.85	5.45	27155	....	....	12.12	11.69	10.15
FW30	1288	Die.	31720	410	8	5.500x4.750	903	2600	(1)	....	....	212.02	6.64	27803	....	....	13.71	12.24	10.08
FW 30 without PTO												220.38	5.85	28302	....	....	14.16	12.73	10.96
FW40	1290	Die.	32950	2320	8	5.500x4.750	903	2600	....	....	....	238.78	6.60	28245	....	....	13.83	12.84	10.73
FW 60	1289	Die.	33970	2870	8	5.500x4.750	903	2600	....	....	....	285.57	7.45	29304	....	....	14.90	13.38	11.27
(1) Equipped with controlled, hydrostatic pto with 105 output horsepower at 1000 rpm.																			
Hesston Fiat																			
480-8 DT and 480-8 12 & 8 Speed	1385	Die.	7805	2485	3	3.937x4.33	158	2600	42.58	540	40.36	37.07	5.07	5265	16.93	12.27	13.34	12.54	10.64
680DT & 680 8 Speed	1352	Die.	10000	2660	4	3.937x4.331	211	2500	62.47	1000	61.20	53.65	5.44	6252	17.40	14.19	14.80	14.20	12.45
780 DT and 780 8-Speed	1386	Die.	10100	3920	4	4.055x4.33	224	2500	70.57	540	66.67	62.06	7.61	6965	16.71	13.96	13.72	13.86	12.26

880DT-5 &																			
880-5 12 Speed	1353	Die.	11560	2810	5	4.055x4.331	?80	2500	81.32	1000	80.95	70.73	7.63	7554	16.27	13.23	13.50	13.44	11.65
980DT & 980 16 Speed	1354	Die.	12645	3795	6	3.937x4.33	316	2400	91.12	996	91.12	77.42	5.00	8351	16.90	13.92	14.25	13.59	12.25
International Harvester																			
Hydro 70 Gas	1154	Gas	10140	2265	6	3.750x4.390	290.8	2400	69.61	540	64.10	55.09	7.00	8427	11.10	7.17	7.65	6.75	5.48
Hydro 70 Die	1155	Die.	10430	1990	6	3.875x4.410	312	2400	69.51	540	65.41	54.11	7.00	8310	12.40	9.31	9.45	8.76	6.97
Hydro 84 Diesel	1316	Die.	9120	3115	4	3.937x5.062	246	2400	58.73	540	56.68	43.59	7.60	6572	14.01	10.50	10.13	9.82	8.34
Hydro 86 Diesel	1337	Die.	10710	2545	6	3.875x4.375	310	2400	70.89	540	66.64	54.10	4.03	8815	14.18	10.23	9.92	9.55	8.24
Hydro 100	1158	Die.	12765	635	6	4.300x5.000	436	2400	104.17	1000	101.30	82.13	6.42	9801	14.83	10.50	10.35	10.19	8.95
Hydro 186 Diesel	1257	Die.	13430	None	6	4.300x5.000	436	2400	105.02	1000	100.31	82.77	6.56	11312	13.68	10.06	9.83	9.84	8.46
284	1277	Gas.	3596	1166	4	2.756x2.992	71.3	2600	25.75	1000	24.33	20.64	4.02	2561	11.62	9.54	9.77	8.97	7.52
284 8 Speed	1387	Die.	3600	860	3	3.27x3.94	99	2600	2747	540	23.92	23.52	5.71	2523	14.40	10.91	10.99	10.53	9.18
354	1115	Gas.	5925	1890	4	3.375x4.000	143.1	1875	32.58	540	32.22	28.37	5.01	4674	10.36	7.99	9.03	8.55	7.23
454	1097	Die.	7470	2750	3	3.875x5.060	179	2200	40.47	1004	40.47	35.83	4.10	5583	14.68	11.48	12.87	11.85	10.07
454	1096	Gas.	7120	2720	4	3.375x4.390	157	2200	40.86	1004	40.86	35.24	4.13	5329	10.94	8.03	9.22	8.40	7.12
464 Gas	1126	Gas.	7355	2460	4	3.562x4.390	175	2400	45.74	540	43.64	42.20	4.51	5465	10.80	8.00	9.65	8.86	7.70
464 Diesel	1127	Die.	7570	2440	3	3.875x5.060	179	2400	44.42	540	41.73	39.97	4.53	5488	14.41	11.49	12.25	12.57	10.67
484 Utility Dsl.	1312	Die.	7710	2710	3	3.875x5.06	179	2200	42.42	540	41.79	38.06	4.78	5500	14.81	11.85	12.75	12.39	10.63
574	1099	Die.	8675	3525	4	3.875x5.060	238.6	2200	52.55	1004	52.55	46.95	4.40	6446	14.46	11.53	12.86	12.38	10.57
574	1098	Gas.	8250	3415	4	3.813x4.390	200.3	2200	52.97	1004	52.97	45.16	4.39	6360	11.25	8.55	9.63	9.05	7.43
584 Utility & Rowcrop	1313	Die.	8850	3185	4	3.875x4.38	206	2300	52.54	540	50.96	47.47	5.07	6859	15.23	12.34	13.41	12.95	11.10
666 Gas	1152	Gas.	10050	2360	6	3.750x4.390	290.8	2000	66.30	543	66.30	59.31	7.39	7981	11.95	8.45	10.08	9.04	7.27
666 Diesel	1151	Die.	10330	2130	6	3.875x4.410	312	2000	66.29	543	66.29	58.34	5.12	8012	14.24	11.60	12.60	11.98	10.16
674 Utility Gas	1128	Gas.	8330	3035	4	3.812x4.390	200	2400	58.53	540	56.01	53.48	7.04	6583	10.83	8.19	9.40	9.11	8.39
674 Utility Die	1129	Die.	8690	3040	4	3.875x5.060	238.6	2400	61.56	540	58.79	55.91	7.03	6833	15.25	12.16	13.52	13.11	11.31
684 Utility & Rowcrop	1314	Die.	9660	3825	4	3.875x5.06	239	2400	62.52	540	58.75	55.92	5.29	6858	15.55	12.21	13.27	13.02	11.28
686 Diesel (same as 666 Diesel)																			
686 Diesel 10 Speed	1336	Die.	10340	2360	6	3.875x4.375	310	2000	66.36	543	66.36	58.81	5.08	8043	16.07	13.16	13.93	13.27	11.53
Farmall 766	1117	Die.	12720	1380	6	3.875x5.085	360	2600	85.45	1000	85.66	74.54	6.48	9236	14.85	10.35	12.08	11.05	9.13
Farmall 766	1094	Gas.	11880	1480	6	3.750x4.390	290.8	2400	79.73	1000	73.96	71.44	4.77	8841	11.78	8.18	9.77	8.68	7.12
784 Rowcrop Diesel	1315	Die.	9920	3830	4	3.937x5.062	246	2400	67.48	1000	64.09	58.65	5.18	8105	16.06	12.75	13.25	12.77	11.07
786 16 Speed	1388	Die.	11930	340	6	3.875x5.0625	358	2400	80.20	1000	77.41	70.25	4.74	9968	15.72	11.40	12.72	11.88	10.00
884 Rowcrop	1376	Die.	10150	3945	4	3.937x5.51	268	2400	72.91	1000	69.76	65.39	5.54	8116	15.76	12.47	13.48	12.91	11.05
886 Diesel	1254	Die.	13040	970	6	3.875x5.085	360	2400	86.14	1000	83.16	76.16	4.70	10485	14.29	10.55	11.77	10.92	9.21
886 Diesel 16 Speed	1338	Die.	13450	1710	6	3.875x5.063	358	2400	86.57	1000	83.91	76.25	4.69	10807	16.01	11.77	12.97	12.21	10.62
886 Dsl. 16 Speed (1)	1339	Die.	13450	1710	6	3.875x5.063	358	2400	90.56	1000	88.23	80.13	4.69	10930	15.84	11.98	12.81	12.38	10.86
(1) Serial No. 2490208 U17026 and up.																			
Farmall 966 Hydro	1095	Die.	12875	1175	6	4.300x4.750	414	2400	91.38	1000	88.29	71.43	8.51	8909	13.80	9.33	9.63	9.19	7.94
966 Diesel	1123	Die.	13670	1970	6	4.300x4.750	414	2600	100.80	1000	101.52	88.94	6.58	10036	15.68	10.94	12.36	11.68	9 84
986 Diesel	1255	Die.	14000	970	6	4.300x5.000	436	2400	105.68	1000	104.18	94.60	4.98	12176	15.56	11.34	12.65	11.72	10.02
1066 Turbo Diesel	1124	Die.	15260	1945	6	4.300x4.750	414	2600	125.68	1000	119.20	108.87	7.03	13000	16.37	11.32	12.78	11.97	9.99
1086 w/Radial Tires	1247	Die.	15640	2915	6	4.300x4.375	414	2400	131.41	1000	133.67	116.28	4.40	13503	16.39	11.90	13.28	12.36	10.45
1086 w/Bias Ply Tires	1247	Die.	15640	3100	6	4.300x4.375	414	2400	131.41	1000	133.67	114.14	6.66	12137	16.39	11.90	12.83	12.08	10.52
1466 Turbo Diesel	1125	Die.	16660	2990	6	4.300x5.000	436	2600	145.77	1000	145.84	127.02	6.93	13673	17.03	11.83	13.03	12.01	10.35
Farmall 1468	1118	Die.	16310	2850	8	4.500x4.313	550	2600	145.49	1000	136.85	129.31	7.33	12932	15.93	12.40	13.87	13.22	11.17
1566 Turbo Dsl.	1174	Die.	18260	3065	6	4.300x5.000	436	2600	161.01	1000	162.31	140.35	5.64	15774	16.16	11.51	12.55	11.69	9.86
1568 Diesel	1175	Die.	17350	2400	8	4.500x4.313	550	2600	150.70	1000	147.79	133.79	5.69	14918	14.99	12.08	13.00	12.59	10.80
1586 w/Radial Tires	1248	Die.	17600	2480	6	4.300x5.000	436	2500	161.55	1000	156.09	140.65	5.55	16665	16.51	12.28	13.02	12.38	10.51
1586 w/Bias Ply Tires	1248	Die.	17600	3010	6	4.300x5.000	436	2500	161.55	1000	156.09	140.08	6.05	15124	16.51	12.28	12.74	12.38	10.54
3388 Diesel	1319	Die.	17850	430	6	4.300x5.000	436	2400	130.61	1000	128.59	114.42	6.67	16764	16.85	12.00	13.52	12.17	10.09
3588 Diesel	1320	Die.	18890	1270	6	4.300x5.350	466	2400	150.41	1000	152.07	130.94	6.65	17589	16.98	12.19	13.13	12.20	10.30
3788 12 Speed	1377	Die	20820	2200	6	4.300x5.350	466	2500	170.57	1000	166.39	146.43	7.49	19069	17.12	12.22	13.24	12.25	10.06
4166	1116	Die.	20010	3685	6	4.300x5.000	436	2400	150.63	1000	152.72	130.47	5.92	19434	16.84	11.80	13.01	11.88	9.93
4366 Turbo D	1153	Die.	23000	1310	6	4.300x5.350	466	2600	....	....	....	168.90	6.65	23138	....	....	12.34	11.98	10.34
4386 Diesel	1256	Die.	24930	None	6	4.300x5.350	466	2600	....	....	....	176.02	8.71	23321	....	....	12.43	11.92	10.18
4568	1216	Die.	29870	4120	8	5.3125x4.50	798	2600	....	....	....	235.72	6.76	27995	....	....	12.89	11.79	9.73
4786 Diesel	1317	Die.	34350	4150	8	5.313x4.500	798	2600	....	....	....	265.55	4.79	33468	....	....	12.80	11.92	9.86
Kubota																			
L185	1285	Die.	3370	1430	2	3.000x3.23	45.3	2800	15.33	540	14.07	13.03	5.57	1939	13.60	10.90	10.38	10.82	9.26
L185DT	1286	Die.	3415	1283	2	3.000x3.23	45.3	2800	15.45	540	14.16	12.65	3.94	2322	13.49	11.00	10.34	10.24	8.70
L225 Diesel	1145	Die.	3452	1457	3	3.000x3.23	68	2700	20.86	1000†	19.96	17.69	6.34	2015	14.25	11.12	10.71	10.78	9.36
L245	1283	Die.	3694	1498	3	3.000x3.23	68	2800	22.06	540	20.11	18.66	5.74	2067	13.98	11.07	10.74	10.70	9.16

Nebraska Tractor Tests Summarized (Tests from 1972 through 1981)

						ENGINE									—FUEL CONSUMPTION (HP Hours Per Gallon) @:—		—Varying Drawbar Power—		
MAKE AND MODEL OF TRACTOR	Test No.	Fuel Used	Weight With Ballast	Lbs. Ballast Carried	No. of Cylinders	Bore and Stroke	Displacement Cu. in.	Rated RPM Dwbr.	Max. PTO HP @ Rated Engine RPM	Std. PTO RPM	Max. PTO HP @ Std. PTO RPM	Max. Drawbar HP	MPH @ Max. Dwbr. HP	Max. Lbs. Pull	Max. PTO HP @ Std. PTO RPM	PTO Average @ Varying Power	Max. Available Power	75% of Pull Max. Power	50% of Pull @ Max. Power
Kubota Cont.																			
L245DT	1284	Die.	3792	1410	3	3.000x3.23	68	2800	22.35	540	20.15	18.48	6.06	2419	14.33	11.21	10.88	10.67	9.22
L285 Diesel	1198	Die.	4030	1585	4	2.992x3.228	91	2400	26.45	540	23.58	22.94	6.62	3134	14.63	12.16	11.78	12.16	10.65
L295DT and L295 8 Speed	1370	Die.	4700	1805	3	3.23 x3.23	79.3	2800	26.46	540	24.91	22.82	4.34	3155	14.59	11.75	11.57	11.39	9.58
L305DT and L305 8 Speed	1371	Die.	5360	2070	3	3.23 x3.23	79.3	2800	26.21	540	25.14	22.96	4.16	3918	13.83	11.14	11.15	11.13	9.46
L345DT and L345 8 Speed	1372	Die.	5435	2000	4	3.00 x3.23	90.7	2800	29.35	540	28.80	26.72	4.62	3795	12.76	10.58	10.68	10.81	9.15
M4500DT & M4500 16 Speed	1348	Die.	7800	2635	6	3.23 x3.23	158.5	2600	49.72	540	44.49	42.70	6.16	4812	15.19	12.22	11.90	12.02	10.77
M5500DT and M5500 16 Speed	136[illegible]	Die.	8710	3210	3	4.134x4.528	182	2400	53.99	540	49.18	46.96	5.51	6287	16.22	12.44	13.05	12.77	11.05
M7500DT & M7500 16 Speed	1349	Die.	9510	3530	4	4.134x4.528	243	2400	72.34	540	66.54	61.29	6.65	6327	17.83	14.15	13.93	14.20	12.40
Lamborghini																			
1056DT	1269	Die.	12050	1700	6	3.86x4.72	331	2220	92.13	1000	89.98	79.51	6.86	9135	15.16	13.02	12.45	12.74	10.93
Leyland																			
245 Diesel	1177	Die.	7850	1970	3	3.600x5.000	152.7	2250	39.73	540	36.38	35.09	4.47	5056	16.30	12.60	13.02	12.67	11.29
255 Diesel	1176	Die.	8610	2310	4	3.858x4.921	230	2200	47.91	540	43.85	43.00	6.58	5891	15.42	11.10	12.78	11.81	9.50
472 & 272 Die.9-Speed	1341	Die.	11990	4580	4	3.858x4.921	230	2200	63.52	540	58.50	53.27	5.91	7224	14.97	12.28	11.32	11.67	10.48
482 & 282 Die 9 Speed	1340	Die.	12000	4590	4	3.858x4.921	230	2200	74.28	540	70.86	61.19	5.86	7032	17.58	12.63	12.70	12.10	10.09
2100 Diesel	1178	Die.	13260	4350	6	3.860x4.920	344.7	2100	88.40	1000	83.30	75.70	4.95	8617	16.29	13.20	13.16	13.24	11.24
Long																			
360 Diesel	1298	Die.	6410	1930	3	3.74x4.33	143	2400	36.16	540	31.06	31.91	5.20	4808	14.41	11.97	12.45	12.13	10.48
R9500 Special	1107	Die.	13700	5530	6	3.875x5.000	354	2250	97.72	540	88.13	82.94	6.13	10216	16.21	13.25	13.02	13.10	11.14
U445	1108	Die.	7800	3320	3	3.740x4.330	143	2400	41.93	540	36.53	37.55	5.51	5910	13.40	12.01	11.84	13.29	11.93
U550	1109	Die.	9110	4540	4	3.740x4.330	190.7	2400	53.61	540	47.66	48.03	7.15	6944	15.10	12.41	13.09	13.21	11.76
900 Diesel and 910 Diesel	1163	Die.	12575	4375	4	4.33x4.72	278	2200	72.88	1000	72.86	62.50	6.53	7843	13.06	12.15	10.97	13.00	11.38
Massey-Ferguson																			
MF184-4 12 Speed	1392	Die.	7775	1395	4	3.875x5.0	236	2200	62.45	540	59.56	52.38	7.13	5500	16.41	12.37	12.61	12.11	10.69
MF205 6 Speed	1363	Die.	2840	935	2	3.46x3.46	65.2	2400	16.56	540	16.34	13.45	4.39	1995	12.97	9.62	9.98	9.65	8.03
MF205-4 6 Speed	1364	Die.	3120	905	2	3.46x3.46	65.2	2400	16.40	540	16.18	13.57	4.86	2131	12.83	9.69	10.04	9.57	8.02
MF210 12 Speed	1365	Die.	3550	1090	2	3.62x3.74	77.1	2500	21.96	540	21.23	18.08	5.81	2159	13.61	11.04	10.84	10.53	9.36
MF210-4 12 Speed	1366	Die.	3765	1030	2	3.62x3.74	77.1	2500	21.77	540	21.02	17.60	6.91	2158	13.18	10.75	9.97	10.44	8.61
MF220 12 Speed	1367	Die.	4220	1455	2	3.82x3.94	90.3	2500	26.37	540	25.52	23.95	4.34	3287	13.36	11.07	11.22	11.60	10.17
MF220-4 12 Speed	1368	Die.	4487	1307	2	3.82x3.97	90.3	2500	26.48	540	26.06	22.82	5.60	3496	14.09	11.56	11.09	11.55	10.02
MF230 Gasoline	1215	Gas.	4870	1030	4	3.375x4.062	145	2000	34.34	540	31.29	29.58	5.08	3717	11.85	8.72	9.89	8.90	7.85
MF230 Diesel	1214	Die.	5110	1110	3	3.600x5.000	153	2000	34.53	540	30.80	29.66	7.64	4030	18.18	14.81	15.06	14.74	12.87
MF235 Gasoline	1194	Gas.	5785	1655	4	3.375x4.062	145	2250	41.13	540	33.87	35.29	5.86	4294	10.49	7.99	8.69	8.07	6.69
MF235 Diesel	1187	Die.	5860	1725	3	3.600x5.000	153	2250	42.39	540	35.29	36.29	5.84	4281	16.78	13.52	13.80	13.39	11.56
245 Diesel	1251	Die.	6150	2100	3	3.600x5.000	153	2250	42.90	540	36.50	36.75	5.92	4279	16.25	12.72	12.43	12.79	11.13
245 Gasoline	1252	Gas.	6020	2120	4	3.375x4.062	145	2250	41.09	540	34.15	35.50	5.90	4298	11.74	9.07	9.50	9.07	7.88
MF255 Gasoline	1190	Gas.	7280	1140	4	3.875x4.500	212	2000	50.01	540	47.14	43.49	5.28	5668	10.91	8.00	8.94	8.54	6.72
MF255 Diesel	1189	Die.	7130	1160	4	3.600x5.000	203	2000	50.69	540	45.55	43.72	5.28	5257	15.88	13.32	13.44	13.36	12.24
255 12-Speed	1250	Die.	7310	895	4	3.875x5.000	236	2000	52.68	540	48.37	44.75	7.89	5591	16.92	12.70	13.34	12.82	11.03
MF265 Diesel	1188	Die.	8200	1815	4	3.875x5.000	236	2000	60.73	540	54.76	51.87	5.23	6248	15.88	13.44	13.52	13.51	12.16
MF275 Diesel	1193	Die.	9330	2720	4	3.975x5.000	248	2000	67.43	540	61.76	60.16	5.16	7292	14.18	12.51	13.04	13.22	11.63
MF285 Diesel	1171	Die.	11760	4110	4	4.500x5.000	318	2000	81.96	1000	81.96	70.53	7.77	8846	14.98	12.68	12.85	12.90	11.34

MF1085 Diesel	1133	Die.	14385	2845	4	4.500x5.000	318	2000	81.58	1000	81.58	70.76	5.58	10355	15.82	13.21	13.43	13.15	11.55
MF1105 Diesel	1132	Die.	16725	4405	6	3.875x5.000	354	2200	100.72	1000	96.43	86.26	4.36	11365	15.43	11.53	12.37	11.55	9.81
MF1135 Diesel	1135	Die.	18900	5350	6	3.875x5.000	354	2200	120.84	1000	118.47	106.52	4.56	13955	16.18	12.24	13.22	12.56	10.71
MF1155 Diesel	1134	Die.	20460	5554	8	4.250x4.75	540	2200	140.97	1000	134.11	124.90	4.40	15630	15.66	12.77	13.15	13.00	11.45
MF1505 Diesel	1172	Die.	20970	3010	8	4.500x5.000	636	2800	174.46	1000	175.95	154.10	6.98	17226	14.55	11.41	12.27	11.43	9.54
MF1805 Diesel	1173	Die.	22790	4790	8	4.500x5.000	636	2800	192.65	1000	191.60	170.17	6.95	18781	14.77	12.14	12.76	12.41	10.77
2675, 8-Speed	1321	Die.	14280	1930	6	3.875x5.0	354	2500	100.84	1000	95.00	86.18	5.91	10226	15.00	11.14	11.48	11.57	10.01
2675, 24-Speed	1309	Die.	14495	2065	6	3.875x5.0	354	2500	103.29	1000	96.67	87.47	5.09	9674	15.43	11.56	11.76	11.49	9.95
2705, 8-Speed	1322	Die.	16800	4295	6	3.875x5.0	354	2500	121.11	1000	114.44	101.47	6.17	12588	16.84	11.22	12.54	11.30	9.45
2705, 24-Speed	1310	Die.	17490	4895	6	3.875x5.0	354	2500	122.20	1000	115.85	104.23	5.30	13085	16.65	11.22	12.74	11.27	9.23
2745 Diesel	1311	Die.	19490	4300	8	4.25x4.75	539	2600	143.40	1000	132.21	125.17	5.51	15386	15.40	10.62	11.96	11.13	9.39
2775	1278	Die	20440	4210	8	4.63x4.75	640	2600	165.95	1000	149.86	143.70	5.72	17407	16.05	11.50	12.57	11.52	9.85
MF2775 8 Speed	1389	Die.	20170	4365	8	4.63x4.75	640	2600	162.09	1000	146.87	139.68	5.73	16766	15.78	11.19	12.45	11.68	9.56
2805 24-Speed	1258	Die.	21170	5540	8	4.630x4.750	640	2500	194.62	1000	181.77	160.72	7.10	17369	16.29	11.33	12.21	11.14	9.27
MF2805 8 Speed	1399	Die.	21430	5395	8	4.63x4.75	640	2500	190.81	1000	186.29	164.58	5.41	17647	16.59	10.97	12.41	11.43	9.58
4800 Die 12 & 18 Speed	1342	Die.	30520	None	8	5.5 x4.75	903	2600	179.31	1000	172.88	159.08	4.82	25294	15.10	10.12	12.13	10.73	8.39
4840 Die 12 & 18 Speed	1343	Die.	30920	None	8	5.5 x4.75	903	2600	210.67	1000	210.61	186.36	4.84	28191	15.57	10.77	12.41	11.25	9.32
4880 Die 12 & 18 Speed	1344	Die.	32450	1360	8	5.5 x4.75	903	2600	272.81	1000	267.38	244.57	6.54	29272	16.80	11.51	13.50	11.98	9.58
MF4900 18 Speed	1391	Die.	33940	2975	8	5.5 x4.75	903	2600	320.55	1000	323.88	278.78	6.53	30090	16.80	11.95	13.26	11.82	9.87
Minneapolis-Moline																			
G955	1161	Die.	12060	None	6	4.375x5.000	451	1800	98.38	1000	98.82	83.40	5.44	8374	13.92	11.93	11.26	11.76	10.29
G1355 Diesel	1141	Die.	18070	974	6	4.750x5.500	585	2200	142.62	1007	142.62	128.95	7.89	14178	15.21	12.47	13.61	12.85	11.23
Oliver																			
2255 Diesel	1140	Die.	17990	1583	8	4.500x4.500	573	2600	146.72	1000	147.65	126.13	5.70	14770	15.66	12.47	13.43	12.85	11.25
Same																			
Panter 4WD Diesel	1185	Die.	12000	2772	5	3.860x4.720	276	2200	80.02	1000	79.10	66.67	5.75	10389	14.79	12.74	12.40	12.30	10.00
Tiger 100 Diesel	1268	Die.	11620	2500	5	4.13x4.72	317	2200	90.45	1000	89.42	78.84	6.35	9116	15.48	13.22	12.41	13.08	11.26
Buffalo 4WD Diesel	1186	Die.	13795	3708	6	4.130x4.720	380	2200	104.94	1000	104.94	88.24	4.24	10941	15.23	12.78	12.47	12.44	10.76
Satoh																			
S650G	1106	Gas.	3640	1400	4	2.677x2.677	60.2	2800	22.03	1000†	20.37	18.78	3.96	2794	9.91	8.38	8.55	9.03	7.88
S750DD &																			
S750D 9 Speed	1347	Die.	5550	1620	3	3.386x4.016	108.4	2500	33.45	540	28.11	28.99	5.93	4295	11.92	10.89	9.86	11.18	9.58
Steiger																			
Wildcat III ST-210																			
& RC-210	1237	Die.	22260	None	8	4.500x5.000	636	2800	....	....	....	171.44	5.84	21052	....	....	12.71	12.58	10.82
Bearcat II	1162	Die.	23020	1585	8	4.500x5.000	636	2800	....	....	....	180.69	6.57	22622	....	....	12.79	12.37	10.92
Bearcat III ST-220	1246	Die.	29380	None	6	5.500x6.000	855	2100	....	....	....	175.58	4.84	26936	....	....	13.24	12.60	11.04
Bearcat III PT225	1272	Die.	30825	None	6	4.75x6.00	638	2200	(1)	....	....	180.86	6.33	29749	....	....	12.02	10.80	9.29
				Bearcat III 225 without PTO								187.59	5.58	29953	....	....	12.81	11.52	10.07
Cougar II	1170	Die.	27995	1305	6	4.750x6.000	638	2200	....	....	....	228.15	4.44	26432	....	....	13.15	12.77	11.59
Cougar III ST-250	1239	Die.	29800	None	6	4.750x6.000	638	2200	....	....	....	210.35	6.38	26612	....	....	12.74	11.90	10.36
Cougar III ST-251	1233	Die.	30840	None	6	5.500x6.000	855	2100	....	....	....	205.82	7.98	26880	....	....	14.74	13.69	11.60
Cougar III PT270	1273	Die.	32210	1495	6	4.75x6.00	638	2200	(1)	....	....	219.39	6.29	30122	....	....	12.73	11.81	10.23
				Cougar III 270 without PTO								224.54	4.89	29950	....	....	12.97	12.45	10.76
Cougar III ST-270	1238	Die.	29930	None	6	4.750x6.000	638	2200	....	....	....	228.96	6.38	25371	....	....	13.32	12.62	10.96
Panther III ST-310	1235	Die.	30850	None	6	5.500x6.000	855	2100	....	....	....	261.78	7.90	26757	....	....	13.95	13.09	11.02
Panther III ST-325	1236	Die.	31080	None	6	5.400x6.500	893	2100	....	....	....	281.94	7.93	28189	....	....	14.82	14.19	12.64
Panther III PTA-325	1355	Die.	33960	3140	6	5.4x6.5	893	2100	....	....	....	274.88	5.34	31876	....	....	14.26	13.45	11.55
Panther III PT350	1274	Die.	34000	2855	8	5.4x4.75	903	2600	(1)	....	....	305.48	6.51	32276	....	....	14.91	13.75	11.32
				Panther III 350 without PTO								311.64	7.38	32059	....	....	15.03	Not Tested	
Tiger II	1169	Die.	29930	2330	8	5.500x4.750	903	2600	....	....	....	270.21	6.73	28097	....	....	13.88	12.70	10.61
Tiger III ST450	1282	Die.	47370	4645	6	6.25x6.25	1150	1700	....	....	....	385.74	5.23	42715	....	....	15.57	Not Tested	

(1) Equipped with controlled hydrostatic pto with 105 output horsepower at 1000 rpm.

Versatile																			
555 Diesel	1331	Die.	25980	6330	8	4.625x4.125	555	2850	182.25	1000	184.35	154.20	4.56	23533	16.33	11.15	12.96	11.17	8.83
835 12 Speed	1356	Die.	28000	3720	6	5.5x6.0	855	2100	198.23	1009	198.23	179.07	6.13	26380	15.13	11.36	13.16	11.87	9.70
875 Diesel	1279	Die.	29500	4980	6	5.5x6.0	855	2100	248.07	1008	248.07	228.35	9.12	24457	15.45	11.76	13.60	12.28	10.40

Nebraska Tractor Tests Summarized (Tests from 1972 through 1981)

					ENGINE										—FUEL CONSUMPTION (HP Hours Per Gallon) @:—				
																	—Varying Drawbar Power—		
MAKE AND MODEL OF TRACTOR	Test No.	Fuel Used	Weight With Ballast	Lbs. Ballast Carried	No. of Cyl-inders	Bore and Stroke	Dis-place-ment Cu. in.	Rated RPM Dwbr.	Max. PTO HP @ Rated Engine RPM	Std. PTO RPM	Max. PTO HP @ Std. PTO RPM	Max. Draw-bar HP	MPH @ Max. Dwbr. HP	Max. Lbs. Pull	Max. PTO HP @ Std. PTO RPM	PTO Average @ Varying Power	Max. Avail-able Power	75% of Pull Max. Power	50% of Pull @ Max. Power
Versatile Cont.																			
875 Diesel	1332	Die.	29480	4160	6	5.5x6.0	855	2100	247.16	1008	247.16	221.66	4.86	26795	16.06	12.02	14.35	12.53	10.34
895 Diesel, 12 Speed	1335	Die.	32500	7880	6	5.5x6.0	855	2100	....	....	....	261.63	6.45	29402	....	....	15.15	13.72	11.57
White																			
2-30 8 Speed	1373	Die.	3853	848	3	3.386x3.386	91.4	2600	28.33	540	24.50	25.81	8.35	2816	12.03	10.27	10.77	11.42	9.61
2-35 8 Speed	1374	Die.	3970	800	3	3.386x4.02	108.4	2400	32.84	540	30.94	30.37	8.00	2978	12.68	10.86	11.23	11.73	10.35
2-45 20 Speed	1395	Die.	6630	660	4	3.858x3.62	169.3	2250	43.73	540	36.62	37.32	3.97	4455	12.70	11.25	10.96	11.00	9.66
2-50 Field Boss	1231	Die.	6880	2325	3	3.940x4.330	158	2500	47.02	540	43.94	41.88	4.80	5640	15.80	13.03	13.26	13.49	11.97
2-60 Field Boss	1232	Die.	8990	3830	4	3.940x4.330	211	2400	63.22	540	54.35	54.78	5.07	7352	17.63	13.82	14.40	13.87	11.93
2-62 20 Speed	1396	Die.	6875	635	4	4.016x4.33	219	2200	61.46	540	54.25	51.63	6.05	4695	16.31	13.85	13.76	13.49	12.08
2-70 Diesel	1212	Die.	9630	1000	6	3.875x4.000	283	2200	70.71	994	70.71	59.47	6.40	7550	14.56	12.28	11.92	12.13	10.72
2-85 Diesel	1213	Die.	12280	580	6	3.875x5.000	354	2200	85.54	1007	85.54	71.93	8.13	9309	14.62	11.72	12.24	11.64	9.71
2-105 Field Boss	1181	Die.	11810	None	6	3.875x5.000	354	2200	105.61	1007	105.61	90.81	6.34	9212	15.76	12.02	12.89	11.95	10.00
2-135	1275	Die.	16360	2225	6	4.56x4.87	478	2200	137.64	1000	138.03	117.67	8.93	11907	14.91	11.38	12.31	11.42	9.73
2-150 Field Boss	1182	Die.	16940	None	6	4.750x5.500	585	2200	147.49	1007	147.49	127.49	5.63	15059	14.46	11.90	12.07	12.14	10.63
4-150 Field Boss	1159	Die.	16960	None	8	4.500x5.000	636	2800	151.87	1000	152.45	133.34	6.34	16925	15.09	11.45	12.46	11.34	9.21
2-155	1276	Die.	16650	None	6	4.56x4.87	478	2200	157.73	1000	162.37	139.68	9.04	14512	15.38	11.91	12.69	11.53	9.97
4-175 Field Boss	1375	Die.	....	....	8	4.5x5.0	636	2600	151.69	1000	151.29	133.72	6.39	19905	15.50	11.70	12.96	11.98	10.01
2-180	1287	Die.	18280	None	8	4.5x5.0	636	2800	181.89	1000	181.89	163.64	6.50	15499	14.38	11.66	12.85	12.48	10.56
4-180 Field Boss	1184	Die.	20600	None	8	4.500x5.000	636	2800	181.07	1000	182.30	156.54	4.59	20469	14.19	11.47	11.79	11.56	9.98
4-210 Field Boss	1318	Die.	23735	None	8	4.5x5.0	636	2800	182.44	1000	182.44	162.25	5.89	22934	14.26	11.53	12.34	12.10	10.25
Yanmar																			
YM240 Diesel	1199	Die.	3305	1355	2	3.543x3.543	70	2400	19.76	540	18.75	16.60	4.86	2442	15.05	12.64	12.35	11.95	10.37

†See complete test for data @ 540 rpm.

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February 7, 1982
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Implement & Tractor

The business magazine of the farm & industrial equipment industry

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CLAAS
DOMINATOR
116

THREE NEW COMBINE DEVELOPMENTS page 8

and reviews of three big Class VI models, page 14

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INTERTEC PUBLISHING CORP.

February 7, 1982 • Vol. 97 • No. 4

Implement & Tractor

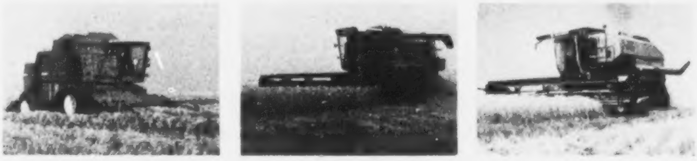
The business magazine of the farm & industrial equipment industry

in this issue...

Three New Combine Developments...

8: **Claas, Versatile, Avco New Idea** introduce new combines. Claas of America's self-propelled model has eight synchronized separating cylinders. Versatile offers a big-capacity pull-type rotary model. Avco New Idea has, in effect, produced the first *corn-only* type of rotary combine with its 858 corn sheller attachment.

...and Reviews of Three Class VI Models



14: **Canada's Prairie Agricultural Machinery Institute** tests Deere's 8820 combine, International Harvester's 1480 Axial Flow model and the Gleaner N-6 combine from Allis-Chalmers.

16: **Should You Own a Leasing Company? These Dealers Do.** The Streacker brothers of Ohio gain maximum benefits for their multi-store operation through their own leasing company.

On the cover... New combines by Claas of America, top; Versatile, lower left, and Avco New Idea, right. Story on page 8.

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Women in engineering

Aspirants warned not to allow a particular field of endeavor to become the "Home-Ec" of the technical disciplines.

By Chuck McMurray

Dr. Rodica Baranescu, a combustion engine expert educated in Romania and currently working in the U.S., speaks about the challenges and opportunities offered to women by an engineering career.

■"I WOULD much prefer to talk on 'alternate fuels for diesel engines'," began Dr. Rodica A. Baranescu, divisional chief engineer of the advanced technology components group for International Harvester. She was addressing the Women Engineers Symposium at the 1981 SAE International Off-Highway Meeting and Exposition, held in Milwaukee in mid-September.

For the informal symposium, Baranescu was asked to speak on the topic, "Women in Engineering—Opportunities and Hurdles." Being a native of Romania, she chose to approach the subject by discussing the differences between the pursuit of technical careers by women in the U.S. and in eastern European countries, using her personal experience as an example.

"It's accepted that most women in Romania must work to help support the family," she explained, "so early on they are encouraged to develop any talent or ability they exhibit. I preferred math and physics in high school and, upon entering college, I chose engineering rather than the pure sciences because it offered more opportunities for subsequent employment."

Her first hurdle, one faced by all regardless of sex, was a competitive screening to gain admittance to the Technical Institute of Bucharest. Subsequently, she opted for the thermal sciences in graduate school, where she was the lone woman in a class of 40, and received her master's degree in internal combustion engines. Through a government arrangement, obligatory upon both students and industry, all graduates were required to work for a minimum of one year. A choice of the available jobs was permitted according to the graduate's rank, but all positions paid the same salary for the minimum period.

In 1965 Baranescu took a teaching post at the Technical Institute where she also conducted research in the use of alternative fuels in diesel engines, received her doctorate in 1971, and rose to the position of Professor in the Chair of Internal Combustion Engines. During that time the Technical Institute of Bucharest and the University of Wisconsin initiated a cooperative exchange program and Baranescu spent 1975 in the U.S. Subsequently, she and her husband, also a research engineer, returned to the U.S. and both are currently employed by IH.

(Continued on page ME-14)

Table 1
Enrollments of women and men full-time by selected curriculum and total 1979

	Women	Men	Total
Chemical	6.477	24,926	31,403
Civil	5,048	39,269	44,317
Computer	2,094	8,814	10,908
Electrical	5,341	64,782	70,123
General	8,991	50,972	59,963
Industrial	2,571	9,600	12,171
Mechanical	4,821	54,557	59,378
All Other	6,684	45,541	52,225
TOTAL	42,027	298,461	340,488

Table 2
Distribution of experienced women engineers By Engineering Discipline

Discipline	Number	%
Aeronautical	1,200	6.1
Chemical	2,600	13.1
Civil	1,600	8.1
Electrical	1,900	9.6
Mechanical	3,300	16.7
Other	9,200	46.4
TOTAL	19,800	100.0

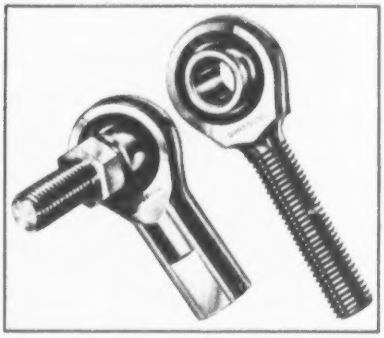
Source: U.S. Scientists and Engineers, 1978 (NSF 80-304), National Science Foundation.

Table 3
Distribution of Engineers by Sex

Discipline	Men	Women	Total	% Women
Aeronautical	42,800	1,200	44,000	2.7
Chemical	59,500	2,600	62,000	4.2
Civil	167,800	1,600	169,500	0.9
Electrical	229,700	1,900	231,600	0.8
Mechanical	221,100	3,300	224,400	1.5
Other	527,600	9,200	536,800	1.7
TOTAL	1,246,500	19,800	1,268,300	1.6

(advertisement)

CONCEPTS IN MOTION TRANSMISSION



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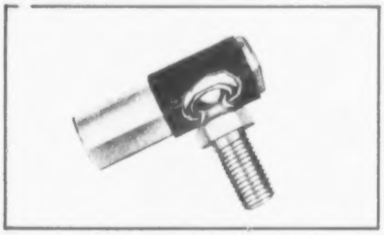
Patented Superior process produces rod ends that provide high wear resistance in demanding applications . . . . at a significant saving. Locks in lubricated raceways of fiberglass reinforced nylon, providing maximum contact with precision hardened steel balls, creating free movement with minimum play. Available in both male and female designs, left and right hand thread styles. Sizes from #10-32 through ¾-16, with and without mounting studs. All units plated and dichromate treated for exceptional corrosion resistance. **Tuthill Corporation, Superior Linkage Division, 2110 Summit Street, New Haven, Indiana 46774.**



Type SPG Ball Joints With Alignment Guide

Type SPG patented ball joint, designed for heavy duty service, has "flat top" alignment guide which makes it easy to align ball stud in vertical position to provide maximum movement in all directions, facilitates torquing of lock nuts. Ball joints swivel in 38° minimum cone. Thread sizes from #10-32 through ½-20. Includes Buna-N rubber dirt shield. Ball cavities packed with Lubriplate. Ball studs case hardened steel. Plated and dichromate treated for exceptional corrosion resistance. **Tuthill Corporation, Superior Linkage Division, 2110 Summit Street, New Haven, Indiana 46774.**

Circle (62) on Reply Card

Women in Engineering

(Continued from page ME-4)

No special treatment

"Women moving into the technical/engineering fields seem to show a preference for chemistry, computer science, and electrical engineering, in that order," Baranescu said. She pointed out that the tendency can probably be attributed, at least in part, to less physically stressful working environments normally associated with these jobs in comparison with other engineering/technical careers. "But," she hastened to add, "these other areas should not exclude women because of that, for some women may seek those challenges. Positions should not be classified on the basis of sex: individuals should be given the opportunity to prove themselves."

When asked about affirmative action programs that would impose hiring quotas, Baranescu expressed a basic dislike for any hiring criteria other than ability, but added that she could understand the necessity for the quota system to "open doors." She looks upon this and similar programs as initial means to overcome long-standing barriers faced by women and minorities: programs that will be unnecessary once women have had ample opportunity to prove their worth in traditionally male-dominated fields. Likewise, promotion should be based solely on ability and merit.

Women represent a vast, untapped resource of which the industrial community should avail itself. Parents, schools, and society in general must cast tradition aside, encourage their daughters to realize their potential, and expose them early on to the opportunities for satisfying technical careers.

Schooling and jobs

Figures from the Engineering Manpower Commission of American Association of Engineering Societies for the most part bear out the opinions of Dr. Baranescu. Information gathered in 1979 from 286 engineering schools reflects the enrollment statistics shown in Table 1. The most popular course of study for women was chemical engineering, followed by electrical and civil. The large number shown in general engineering consists mainly of early-year students who have not yet reached the point of designating a major field of study.

The enrollment statistics differ slightly from the 1978 National Science Foundation figures, which report the distribution of experienced women engineers by discipline. As shown in Table 2, the mechanical engineering field is where the largest single percentage of women are employed, with chemical and electrical next. Although the greatest concentration of women is in mechanical engineering, Table 3 shows the highest proportion of women as compared with men is in chemical engineering.

Salary

According to AAES, the most sought after group in 1980 were women holding degrees in chemical engineering. Salary offers, about 1.4 per woman graduate in this group, averaged $1,804 per month. Only women with a degree in petroleum engineering received a higher average offer: $1,995 per month.

The average salary offered to women engineering graduates in all disciplines in 1980 was $1,725 per month, compared with an average salary of $1,695 offered to their male counterparts.

With nearly 6,000 graduates at the bachelor level per year, women are a steadily increasing percentage of the engineering profession and, accordingly, they are becoming more of a factor in the professional labor market our industries depend upon. ☐

"When you learn CPR, you're ready to save lives–anywhere." American Red Cross

C4725-1 3/15/82

February 21, 1982

Implement&Tractor

The business magazine of the farm & industrial equipment industry

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CONGRESSIONAL INFO SERV
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TWO-YEAR SALES FORECAST:

1982 An improvement (2nd half)

1983 Looks pretty good

S

2nd half
82
83

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in this issue...

8: Industry Forecast: Marketing executives of FIEI's farm and agri-equipment divisions see sales improving during the second half of 1982 and getting better in 1983.

12: Approaches to Energy Savings in Basic Components. Ways of doing more work with less time and energy are explored by engineers working with engines and transmissions.

18: Paths of Growth. Two farm equipment dealers in New Zealand and Australia take different approaches: One does some manufacturing, the other concentrates on satellite operations.

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what's ahead...

February 21, 1982

RETAIL SALES OF FARM EQUIPMENT IN THE U.S. wound up the year with some December advances but with generally depressed results for the full year. Two-wheel-drive tractors were up 23 per cent for December, but December 1980 was a weak sales month. Combine sales finished strong in December and up for the year. The flash report of the Farm & Industrial Equipment Institute included these numbers:

Unit Retail Sales

	December			January-December		
	1981	1980	Pct. Change	1981	1980	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
40-100 hp	3,829	3,225	+18.7	50,966	58,121	-12.3
Over 100 hp	3,486	2,713	+28.5	43,188	50,328	-14.2
Total 2-wheel drive	7,315	5,938	+23.2	94,154	108,449	-13.2
4-wheel drive	813	905	-10.2	9,676	10,887	-11.1
Total Tractors	8,128	6,843	+18.8	103,830	119,336	-13.0
Combines (S-P)	1,921	1,690	+13.7	26,830	25,760	+ 4.2
Balers*	234	411	-43.1	13,609	14,022	- 2.9
Forage Harvesters**	248	340	-27.1	7,603	9,461	-19.6
Mower Conditioners	512	741	-30.9	18,522	19,452	- 4.8

*Bales under 200 lbs. **Shear-bar type.

CANADIAN RETAIL SALES presented a similar picture. Here is the December flash report provided by the Canadian Farm & Industrial Equipment Institute:

Unit Retail Sales

	December			January-December		
	1981	1980	Pct. Change	1981	1980	Pct. Change
Farm Wheel Tractors	1,935	2,388	-19.0	27,217	29,298	- 7.1
Combines (S-P)	324	371	-12.7	5,043	4,115	+22.6
Mower-Conditioners	44	108	-59.0	3,879	4,209	- 7.8
Balers*	46	83	-44.6	3,231	4,030	-19.8

*Bales under 200 lbs.

LYLE E. YOST, HESSTON CORP. CHAIRMAN, will relinquish his post as chief executive officer soon and will recommend at the company's annual meeting in April that Howard Brenneman, president and chief operating officer, be named CEO. Yost, who founded Hesston in 1947, said he is willing to continue serving as chairman.

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RETAIL SALES OF WHEEL TRACTORS*
(In Units)

					Cumulative for Jan.-Nov., 1980				Cumulative for Jan.-Nov., 1981			
	Total Wheel Tractors†				Farm Type				Farm Type			
	Nov. 1980		Nov. 1981		2-Wheel Drive	4-Wheel Drive	Total Farm	Non-Farm	2-Wheel Drive	4-Wheel Drive	Total Farm	Non-Farm
	Farm	Non-Farm	Farm	Non-Farm								
Alabama	107	19	134	14	2,052	62	2,114	365	1,621	27	1,648	270
Alaska	.....	5	.....	.....	24	6	30	42	33	1	34	62
Arizona	62	20	47	17	787	93	880	438	772	74	846	338
Arkansas	162	34	183	18	2,840	326	3,166	500	2,516	298	2,814	294
California	369	138	265	100	4,084	401	4,485	2,519	3,650	421	4,071	1,828
Colorado	63	14	76	23	1,043	204	1,247	569	919	199	1,118	411
Connecticut	14	21	14	21	220	6	226	206	157	2	159	138
Delaware	7	1	5	3	135	9	144	36	99	3	102	44
Florida	165	64	164	57	2,356	108	2,464	1,089	2,169	67	2,236	993
Georgia	154	33	150	45	2,777	49	2,826	561	2,227	23	2,250	460
Hawaii	5	4	6	3	66	2	68	84	57	7	64	61
Idaho	155	9	90	2	1,153	178	1,331	135	1,209	249	1,458	129
Illinois	554	37	531	34	5,189	825	6,014	788	4,087	769	4,856	612
Indiana	374	21	224	10	3,082	470	3,552	437	2,183	364	2,547	294
Iowa	690	20	554	14	5,935	703	6,638	264	4,970	585	5,555	230
Kansas	346	15	176	9	3,389	710	4,099	305	2,414	473	2,887	219
Kentucky	213	19	191	14	3,580	75	3,655	465	2,896	41	2,937	388
Louisiana	238	34	162	49	2,536	243	2,779	579	2,393	202	2,595	647
Maine	10	3	24	6	231	3	234	86	238	6	244	74
Maryland	47	20	60	14	659	31	690	324	519	17	536	300
Massachusetts	4	14	9	9	135	1	136	265	141	.....	141	213
Michigan	311	20	187	22	2,410	302	2,712	729	2,127	337	2,464	512
Minnesota	484	18	345	15	4,243	717	4,960	353	3,733	588	4,321	241
Mississippi	314	21	156	20	3,079	242	3,321	376	2,383	164	2,547	243
Missouri	262	25	213	18	3,629	230	3,859	552	3,053	246	3,299	353
Montana	86	7	123	10	1,072	277	1,349	201	853	292	1,145	146
Nebraska	329	5	139	10	3,184	354	3,538	173	2,398	234	2,632	119
Nevada	1	4	3	3	104	11	115	115	68	10	78	112
New Hampshire	9	7	13	4	136	2	138	99	129	.....	129	86
New Jersey	11	17	12	20	275	4	279	456	204	.....	204	373
New Mexico	24	18	27	9	389	19	408	220	323	33	356	192
New York	172	55	152	36	2,347	99	2,446	850	2,031	158	2,189	702
North Carolina	272	34	280	27	3,286	51	3,337	596	2,505	40	2,545	493
North Dakota	235	16	230	10	1,578	802	2,380	143	1,714	808	2,522	87
Ohio	324	48	228	34	3,432	367	3,799	831	2,469	311	2,780	563
Oklahoma	200	25	122	60	2,520	353	2,873	579	2,205	282	2,487	667
Oregon	86	15	66	18	1,279	80	1,359	373	1,033	100	1,133	242
Pennsylvania	109	34	140	38	2,027	51	2,078	961	1,719	54	1,773	700
Rhode Island	1	5	.....	1	16	.....	16	45	14	.....	14	28
South Carolina	90	15	86	15	1,377	47	1,424	347	990	32	1,022	293
South Dakota	225	9	150	2	1,613	262	1,875	95	1,309	269	1,578	64
Tennessee	158	34	197	12	2,807	91	2,898	445	2,427	54	2,481	287
Texas	549	168	556	183	8,941	579	9,520	3,294	9,751	547	10,298	3,273
Utah	42	9	26	13	602	33	635	326	554	24	578	270
Vermont	12	.....	17	2	322	3	325	42	305	3	308	44
Virginia	113	15	115	15	2,026	25	2,051	506	1,477	17	1,494	307
Washington	123	30	117	32	1,772	185	1,957	447	1,288	175	1,463	362
West Virginia	21	14	37	2	430	.....	430	187	330	.....	330	120
Wisconsin	340	25	273	12	4,439	249	4,688	457	3,610	223	3,833	323
Wyoming	23	13	18	16	346	40	386	156	314	34	348	154
U.S. Government	.....	.....	.....	7	220	.....	220	590	15	.....	15	148
Miscellaneous‡	15	82	9	43	317	.....	317	578	238	.....	238	603
TOTAL	**8,680**	**1,333**	**7,102**	**1,171**	**102,491**	**9,980**	**112,471**	**25,183**	**86,839**	**8,863**	**95,702**	**20,114**

Data released January 25, 1982, Farm & Industrial Equipment Institute.

*Figures do not include garden tractors, motor tillers or contractors off-highway types. Report includes units marketed by these firms: Allied Farm Equip. (Leyland Satoh); Allis-Chalmers; Belarus; J I Case; Deere; Deutz; Ford; International Harvester; Long; Massey-Ferguson; R. M. Wade (Satoh); Steiger; Versatile; and White.

†The monthly sales are those reported for that month only. The cumulative totals are subject to revision reflecting updating in the basic sales data.

‡Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

SALES BACKGROUND, SALES OUTLOOK: 1982, 1983

(Retail sales of units, United States)

Product	1980 Actual Sales	1981 Actual Sales*	1982 Forecast Unit Sales	1982 Forecast Pct. Change	1983 Forecast Unit Sales	1983 Forecast Pct. Change
Tractors						
Under 40 HP	48,742	47,800E	48,200E	+0.8	50,500E	+ 4.8
40-99 HP	56,121	50,986	51,000	+0.1	53,600	+ 5.1
100 HP and over	50,328	43,183	43,350	+0.4	48,000	+10.7
Four-wheel drive	10,887	9,676	10,265	+6.1	11,300	+10.1
Total	166,078	151,630E	152,815E	+1.8	163,400E	+ 7.0
S-P Combines	25,760	26,830	27,755	+3.5	29,000	+ 6.3
Corn Heads	17,785	16,800	18,040	+7.4	19,000	+ 5.3
Forage Harvesters (1)	9,453	7,650	7,900	+3.9	8,400	+ 6.3
Conventional Balers (2)	14,022	13,609	13,500	−0.8	13,600	0
Big Balers	16,453	16,450E	17,000E	+3.1	18,350E	+ 8.1
Windrowers	7,100	6,800	6,600	−1.5	6,700	+ 2.0
Mower-Conditioners	19,452	18,522	18,900	+2.0	20,500	+ 8.5
Moldboard Plows	24,000	18,500E	17,000E	−8.1	16,550E	− 2.6
Disk Harrows	51,800	45,100E	47,500E	+5.3	50,500E	+ 6.4
Field Cultivators	14,500	14,000E	14,650E	+4.7	15,900E	+ 9.0
Chisel Plows	14,000	13,440E	14,100E	+4.8	15,450E	+ 9.5
Grinder Mixers	8,500	6,250	6,700	+7.2	7,700	+14.9
Manure Spreaders (4)	14,000	12,460	13,350	+1.8	14,000	+ 4.9

*Preliminary figures. E—I&T estimates. (1) Shear-bar type. (2) Bales under 200 lbs. (3) Bales over 200 lbs. (4) Box type.
Source: Farm & Industrial Equipment Institute.

The big forecast of 1982-1983:

THIS YEAR—IMPROVEMENT IN 2nd HALF NEXT YEAR—LOOKING GOOD

Robert Green (J I Case Co.) delivered the report on the consensus outlook at the Marketing & Management Conference, held by the FIEI Jan. 24-26 at Rancho Mirage, Calif.

Industry marketers see moderate sales advances, getting better later in the year, and from this distance 1983 looks even better.

By Bill Fogarty

■IT'S THE "State of the Industry" sales forecast. Marketing executives of the Farm & Industrial Equipment Institute's Farm and Agri-Equipment divisions participate. Since it's the only public and broad-scale estimate of what will happen, and since it is fairly detailed in terms of numbers and percentages, it has to be considered the best divining rod available to this industry's watchers.

It's a consensus forecast. According to the rules of the game, marketing executives of member companies take their best shot at predicting the percentage, if any, by which unit sales of a product type will change up or down. Each player is expected to call the shots as he thinks they will apply to the whole industry, not just to his own company.

The FIEI takes its members' responses—collected in late December—and establishes the median estimate for each item. In addition to what they think will happen with individual products, the respon-

(More...)

dents give opinions on such items as farmers' cash receipts, farmers' net income, acres planted in certain crops, industry dollar volume, their own advertising outlays, prime rates and the long-term outlook.

(I&T Feb. 7's What's Ahead and Editor's Notebook carried looks at long-term outlook commentary and at advertising outlays in relation to 1982 sales volume.)

When it is all computed, members get their first look at the consensus forecast as part of the FIEI's Marketing & Management Conference.

The report

This year, the conference was held Jan. 24-26 at Rancho Mirage, Calif. Reporting on the forecast survey's outcome was Robert Green, J I Case Co.'s general marketing manager for North America and Latin America.

For a quick review of how they forecast product sales in 1982 and 1983, refer to the two tables that are part of this article. The percentages are the median estimates. Some of the unit numbers have been estimated by I&T because FIEI this year is not divulging numbers on product groups that do not have public reporting programs.

Here are several additional items:

Farm receipts, net income: Farm Equipment Div. (FED) participants see farmers' 1982 gross income at $153.7 billion; Agri-Equipment Div. members see it slightly higher at $155 billion. Next year, it's expected to rise to $167 billion (FED) and $170 billion (AED).

The 1982 take for farmers should net out at $22.5-23 billion. Next year, both see it rising to $26 billion.

Even though the median estimates of both groups are similar, there are broad ranges of opinion. Net farm income in 1982, for example, is predicted at from a low of $16.1 billion to a high of $30 billion. In 1983, the spread is from $20.6 billion to $38.5 billion.

1982 dollar volume. FED members have less diversity opinion about how the industry's dollar volume will run this year than do AED executives. FED estimates range from plus 12 to minus 8 per cent. AED predictions go all the way from plus 25 to minus 12. But the mid-point for both groups was for a plus 5 per cent.

Interest rates: How high, how low, when?

How capable are farm and agri-equipment marketers of predicting what will happen with interest rates? In January 1981, they were generally expecting it to get down to 13 per cent by August.

Unfortunately, interest rates didn't get that low in August 1981, or any time after that. So the marketers have to take low marks in that department.

They needn't feel bad, however. Economists in the hire of big banks, brokerage houses, the government and other institutions that worry with money didn't do much better in 1981. So it can be argued that farm equipment people are entitled to take their shot at forecasting the money game as well as anyone else.

These marketers also estimated, in early 1981, how low the prime rate would have to get before it would not be a deterrent to sales. Their median estimate was 12 to 13 per cent.

Give them good marks on that part. Interest rates never got that low—and sales were deterred all year long.

As part of the 1982 "State of the Industry" survey, the marketers were asked to indicate in which month of the year they thought interest rates would peak and when they would hit their low point. Here's how they answered:

1982 Month	Peak (Number replying)	Low
January	7	11
February	1	8
March	11	16
April	4	12
May	6	7
June	7	3
July	7	3
August	8	6
September	12	5
October	12	4
November	3	3
December	4	4

Next, they were asked to predict the interest rate high and low levels for 1982. Here's what they came up with:

Interest Rate (Pct.)	High (Number replying)	Low
22	2	...
21	1	...
20	12	...
19	9	...
18	27	...
17	10	...
16	13	1
15	7	7
14	...	26
13	...	18
12	...	20
11	...	7
10	...	3

Next, they were asked to indicate

(Continued on page 22)

AGRI-EQUIPMENT FORECASTS, 1982, 1983
(Per cent change, retail dollar volume)

Product Group	1982	1983
Chemical Application Equipment	+ 6.0	+ 5.0
Portable Augers, Elevators	+ 5.0	+ 10.0
Bin-Type Crop Dryers	+ 10.0	+ 10.0
Batch, Continuous-Flow Dryers	-0-	+ 8.0
Farmstead Equipment		
Dairy, Beef	-0-	+ 10.0
Hogs	+ 3.0	+ 13.0
Grain Bins	+ 10.0	+ 10.0
Milking Machines	-0-	+ 5.0

Source: Farm & Industrial Equipment Institute

Sales Forecast

(Continued from page 10)

how low they thought the interest rate would have to be before it would not be a deterrent to sales. Their answers:

Interest Rate (Pct.)	Survey Responses
17	1
16	0
15	10
14	9
13	14
12	33
11	6
10	5
9	3

Finally, when will the sales change happen in 1982?

First half: 8
Second half: 56
Through the year: 12

The responses to these questions indicate considerable diversity of opinion, but they can be summed up thus:

Interest rates are expected to peak most likely in late summer or early autumn, but are not likely to get up much above 18 per cent. The low point for interest rates is expected to come soon, early in the spring, getting down to 12 to 14 per cent. This would come close to the no-deterrent level cited by most respondents—12 per cent interest. And sales activity is expected to show most strength in the second half of the year.

If this is an accurate summary of the feelings of survey respondents, they are indicating that high interest rates should be less of a sales deterrent—though still a deterrent—than they have been in recent years. The sales pickup is seen as coming in the second half of the year, when the rates are anticipated to be up.

Will it be on target?

So that is the "State of the Industry" sales forecast report. How accurate is it likely to be?

The history of this business has shown that its sales sometimes are substantially impacted, favorably or not, by events that cannot usually be expected.

For example, nobody anticipated the Soviet Union's huge purchases of farm commodities in the early 1970s that helped send net farm income to $32 billion in 1973. Similarly, nobody in this industry had any experience a few years ago with interest rate levels that are commonplace today. So if events unfolding through 1982 should prove the forecast wrong, the participants should not be criticized too severely.

But the welfare of each farm equipment marketer's company is closely tied to how well he forecasts sales. Thus, most participants in the forecast are seriously committed to the task of prediction. When the survey form comes from the FIEI office, most of them are completing a lot of vital homework.

It will probably take close to half the year to find out if the consensus forecast has more hits than misses. Knowing this, the FIEI will conduct an update version of the 1982 survey in late April or early May. It will be reported when the next Marketing & Management Conference is held May 27-28 at Ohio State U. in Columbus. ☐

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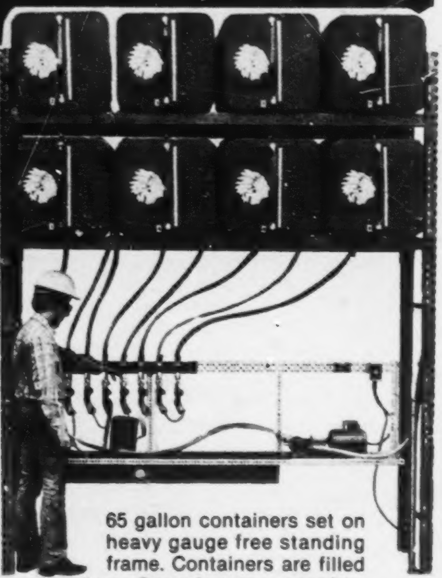

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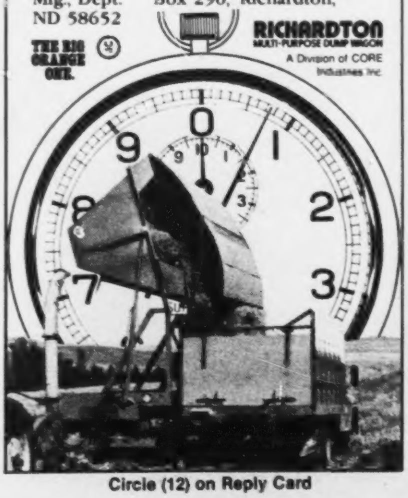

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RETAIL SALES OF SELECTED FARM EQUIPMENT – Jan.-Nov. 1980 and 1981(1)

(In Units)

	Combines Self-Propelled		Corn Heads		Hay Balers(2)		Windrowers Self-Propelled				Grinder-Mixers		Shear-Bar Forage Harvesters(3)	
							Power Units		Total Heads					
	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
Alabama	235	245	61	56	147	219	2	.....	1	.....	116	83	34	37
Alaska	5	3	.....	.....	18	14	3	.....	4	.....	1	3	.....	1
Arizona	55	80	7	1	44	50	60	58	72	67	8	5	11	13
Arkansas	655	789	5	4	182	275	.....	4	.....	4	74	41	11	14
California	262	339	52	58	165	161	273	272	302	302	5	5	69	85
Colorado	326	308	147	119	429	387	211	198	228	217	62	55	97	57
Connecticut	.....	1	.....	2	54	52	.....	.....	.....	.....	1	1	40	41
Delaware	42	29	44	31	15	8	1	1	1	1	8	9	12	3
Florida	73	61	50	29	73	85	.....	2	.....	2	42	12	25	32
Georgia	365	434	293	207	186	233	1	.....	1	.....	248	92	104	92
Hawaii	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....
Idaho	410	424	19	12	591	485	391	283	401	295	55	28	74	40
Illinois	2,521	2,545	2,640	2,494	323	241	22	11	22	13	452	339	256	210
Indiana	1,402	1,225	1,503	1,259	310	300	8	7	8	7	349	211	181	124
Iowa	2,713	2,761	2,919	2,992	317	299	131	125	138	137	1,142	867	545	380
Kansas	1,716	1,555	331	188	301	338	274	267	284	285	226	148	259	171
Kentucky	339	347	265	228	282	328	3	27	3	30	284	168	173	154
Louisiana	422	388	3	5	65	119	.....	.....	.....	.....	19	11	19	10
Maine	7	8	.....	4	70	75	2	.....	2	.....	1	2	43	32
Maryland	141	139	159	154	116	89	13	7	14	7	36	25	76	72
Massachusetts	.....	.....	.....	.....	49	44	6	.....	6	.....	3	.....	37	30
Michigan	544	525	523	513	373	280	63	44	64	45	232	170	410	280
Minnesota	1,556	1,697	1,368	1,283	713	664	626	576	644	607	547	494	833	631
Mississippi	515	512	6	15	77	124	2	.....	1	.....	43	34	60	49
Missouri	981	1,258	481	410	420	522	83	46	90	48	465	310	183	125
Montana	399	547	6	11	384	279	424	397	473	446	63	41	36	37
Nebraska	1,444	1,388	1,351	1,083	204	179	289	272	303	298	456	329	354	311
Nevada	3	3	.....	.....	38	30	57	50	62	50	2	2	8	7
New Hampshire	.....	.....	.....	.....	57	51	.....	.....	.....	.....	.....	2	34	30
New Jersey	26	17	18	12	38	35	.....	.....	.....	.....	7	10	16	8
New Mexico	38	46	15	7	127	136	63	57	66	62	12	9	7	6
New York	168	184	217	236	747	579	67	52	68	53	110	104	814	747
North Carolina	386	457	375	398	289	279	2	1	2	1	154	106	90	93
North Dakota	945	1,277	57	115	55	67	562	705	609	799	131	103	143	193
Ohio	1,124	787	1,046	786	511	474	9	10	9	10	365	237	257	205
Oklahoma	547	517	22	12	396	496	99	109	107	115	116	79	34	33
Oregon	224	239	8	23	403	307	259	198	282	227	29	21	49	57
Pennsylvania	184	189	269	220	727	652	50	42	53	43	283	197	519	470
Rhode Island	.....	.....	.....	.....	7	2	7	.....	6	.....	.....	.....	1	2
South Carolina	200	210	123	104	79	97	.....	.....	.....	.....	64	37	36	36
South Dakota	489	540	276	277	94	82	510	447	553	500	287	194	386	317
Tennessee	358	413	151	117	379	502	1	2	1	2	187	154	143	142
Texas	929	1,158	293	264	717	1,101	84	85	89	98	225	160	81	81
Utah	38	45	10	5	332	334	129	123	141	129	29	11	98	57
Vermont	1	8	1	12	108	102	4	5	4	5	.....	3	153	108
Virginia	115	146	120	118	383	298	7	9	7	10	90	70	197	160
Washington	426	433	33	47	431	374	188	122	191	149	19	9	142	73
West Virginia	5	3	5	3	157	128	1	.....	1	.....	26	10	27	28
Wisconsin	648	568	769	641	1,433	1,192	381	274	390	284	492	389	1,896	1,452
Wyoming	53	58	14	14	192	207	195	158	211	163	22	18	42	19
U.S. Government	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miscellaneous (4)	.....	3	6	12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
TOTAL	**24,035**	**24,909**	**16,062**	**14,581**	**13,608**	**13,375**	**5,563**	**5,046**	**5,914**	**5,511**	**7,588**	**5,408**	**9,117**	**7,355**

Data released January 25, 1982, Farm & Industrial Equipment Institute.

(1) Includes revisions for prior months.
(2) For making bales of under 200 lbs.
(3) Pull-type, mounted, self-propelled.
(4) Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

Mower Conditioners All Types		Manure Spreaders Conveyor-Type		
1980	1981	1980	1981	
140	170	18	16	Alabama
8	12	1	3	Alaska
9	15	6	6	Arizona
357	465	82	78	Arkansas
44	43	61	56	California
157	139	57	45	Colorado
94	51	62	58	Connecticut
18	10	55	43	Delaware
83	86	29	22	Florida
223	211	45	32	Georgia
.....	.....	1	.....	Hawaii
162	144	120	99	Idaho
591	526	552	451	Illinois
499	487	463	381	Indiana
1,049	955	1,253	1,146	Iowa
599	619	187	121	Kansas
787	881	248	232	Kentucky
46	77	26	16	Louisiana
116	104	106	57	Maine
112	99	202	137	Maryland
51	53	68	57	Massachusetts
667	461	678	606	Michigan
1,023	971	1,360	1,099	Minnesota
101	105	19	16	Mississippi
1,145	1,422	302	236	Missouri
149	165	47	23	Montana
455	433	323	178	Nebraska
9	9	5	4	Nevada
71	55	55	36	New Hampshire
54	38	48	37	New Jersey
21	26	9	7	New Mexico
1,129	983	1,337	1,211	New York
265	244	135	101	North Carolina
133	179	100	62	North Dakota
771	623	767	609	Ohio
593	663	49	27	Oklahoma
275	178	104	74	Oregon
905	758	1,118	936	Pennsylvania
4	3	.....	.....	Rhode Island
76	133	26	13	South Carolina
83	134	200	165	South Dakota
556	728	151	114	Tennessee
1,075	1,425	136	132	Texas
192	172	112	80	Utah
243	189	211	188	Vermont
656	504	216	131	Virginia
254	194	125	90	Washington
168	150	54	58	West Virginia
2,436	1,844	2,032	1,669	Wisconsin
53	74	37	22	Wyoming
.....	.....	.....	.....	U.S. Government
.....	.....	2	.....	Miscellaneous
18,707	**18,010**	**13,400**	**10,980**	**TOTAL**

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Dothan, Alabama
(January 12, 1982)

ALLIS-CHALMERS TRACTOR

7040 diesel, 1975 (Fair)	6800*

CASE TRACTORS

1070 diesel, 1970 (Fair)	5800
585C diesel, fork lift, 1977 (Excellent)	8900*
580B diesel, ldr., backhoe, 1973 (Good)	7750*
580B diesel, ldr., backhoe, 1972 (Fair)	6700
580B diesel, ldr., 1972 (Fair)	5000

DAVID BROWN TRACTORS

990 diesel, 1968 (Fair)	1300
990 diesel, 1967 (Fair)	1350

MASSEY-FERGUSON TRACTORS

1105 diesel, 1977 (Fair)	4700
1100 diesel, 1967 (Fair)	3500
285 diesel, 1977 (Good)	6800
285 diesel, 1975 (Good)	6850
285 diesel, 1975 (Good)	6600
275 diesel, 1975 (Good)	5800
255 diesel, 1979 (Excellent)	7200
255 diesel, 1976 (Good)	6250
255 diesel, 1975 (Fair)	5200
245 diesel, 1977 (Good)	5100*
235 diesel, 1976 (Rough)	2850
235 diesel, 1975 (Good)	4100
180 diesel, 1968 (Good)	3300*
180 diesel, 1967 (Good)	3400*
175 diesel, 1971 (Fair)	2600*
175 diesel, 1970 (Fair)	2500*
175 diesel, 1969, (Excellent)	4200
175 diesel, 1969 (Good)	3500*
175 diesel, 1967 (Good)	3200
165 diesel, 1974 (Good)	3800
165 diesel, burned, 1974 (Rough)	2350*
165 diesel, 1972 (Rough)	2400*
165 diesel, 1971 (Fair)	2800*
165 diesel, 1969 (Fair)	2900*
165 diesel, 1969 (Good)	3325
165 diesel, 1968 (Good)	3150*
150 diesel, 1965 (Good)	3150*
135 diesel, 1973 (Excellent)	3475
135 diesel, 1973 (Good)	3100
135 diesel, 1969 (Good)	2900
135 diesel, 1966 (Fair)	2400*
135 diesel, 1966 (Good)	3200
135, 1966 (Good)	3200
135, 1965 (Fair)	2500
50 diesel, 1962 (Good)	1650
35, ldr., 1959 (Good)	2500*
35, 1958 (Good)	1600*
TO30, 1952 (Fair)	700

FORD TRACTORS

5000 diesel, 1968 (Excellent)	4850*
4000 diesel, 1972 (Excellent)	4500*
4000 diesel, 1970 (Good)	3900
4000 diesel, 1966 (Fair)	2700
4000 diesel, 1963 (Good)	2300*
3600 diesel, 1979 (Excellent)	6750*
3600 diesel, 1979 (Good)	4750
3000 diesel, 1969 (Excellent)	4300*
3000 diesel, 1969 (Good)	3450*
3000 diesel, 1967 (Good)	3250*
2000 diesel, 1976 (Good)	3100
2000 diesel, 1974 (Excellent)	3600*
2000, 1963 (Good)	2250
1900 diesel, 1979 (Excellent)	5500*
1600 diesel, 1979 (Excellent)	3300*
841, 1958 (Good)	2000
841, 1958 (Fair)	1650
641, 1959 (Good)	2050
641, 1959 (Good)	1900*
640, 1955 (Good)	1725
Major diesel, 1954 (Fair)	600
NAA, 1954 (Excellent)	1700
Jub., 1953 (Good)	1500*
Jub., 1953 (Good)	1625
8N, 1952 (Excellent)	1650*
8N, 1951 (Good)	1200*
8N, 1951 (Fair)	800
8N, 1950 (Fair)	825

INTERNATIONAL HARVESTER TRACTORS

706 diesel, 1966 (Fair)	2500
674 diesel, 1974 (Good)	4100
656, 1970 (Good)	2900
634 diesel, (Fair)	2100*
414, 1963 (Good)	1400*
340 diesel, 1961 (Fair)	850
275, 1959 (Fair)	700
200, 1955 (Good)	700
186 diesel, hydro, 1981 (Excellent)	20,000*
100, 1955 (Good)	1250
Sup. A, 1949 (Good)	1000
A, 1940 (Good)	375
Cub, mo., 1948 (Fair)	1050*
Cub, 1948 (Fair)	1050*

(More...)

For complete listing of manufacturers and addresses, see the

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Auctions *(continued)*

JOHN DEERE TRACTORS

4630 diesel, duals, 1974 (Excellent)	16,000*
4630 diesel, cab, duals, 1974 (Excellent)	14,700*
4440 diesel, cab, duals, 1975 (Excellent)	21,500*
4430 diesel, 1974 (Good)	13,800*
4430 diesel, 1974 (Good)	12,500*
4320 diesel, 1972 (Fair)	6900*
4230 diesel, cab, 1974 (Good)	12,000
4020 diesel, 1967 (Good)	5500*
3020 diesel, 1966 (Excellent)	6000*
2640 diesel, 1977 (Excellent)	9700*
2640 diesel, 1978 (Excellent)	7350
2030 diesel, 1973 (Good)	4800*
2030 diesel, 1974 (Good)	4600
2010, 1961 (Good)	1375
2010 diesel, 1961 (Fair)	800*
1120 diesel, (Good)	2600*
1020 diesel, 1967 (Excellent)	3700
1020 diesel, 1966 (Good)	3300
1020 diesel, mo., 1966 (Fair)	1800*
430, 1958 (Good)	1250
70 LP, 1954 (Good)	700*
40, 1953 (Fair)	575

LONG TRACTORS

900 diesel, (Excellent)	4500*
560 diesel, (Good)	2300
510 diesel, (Excellent)	5400*
360 diesel, (Excellent)	3300*

OLIVER TRACTORS

2-62 diesel, 1970 (Good)	2400
55 diesel, 1956 (Good)	800

SATOH TRACTOR

S650 diesel, (Excellent)	2000

YODER & FREY, INC.
Archbold, Ohio
January 11 & 12, 1982

ALLIS-CHALMERS TRACTORS

B, 1947 (Rough)	350*
WD, 1951 (Good)	800*
WD-45, 1951 (Fair)	850
D-17, 1966 (Good)	3750
180, 1969 (Good)	3850
190-XT, 1968 (Fair)	3300*
190-XT, 1971 (Good)	5400*
200, 1972 (Good)	6500*
5040, 1979 (Good)	4550

DAVID BROWN TRACTORS

990,	950
1200, (Good)	3150*

CASE TRACTORS

730, 1965 (Fair)	2750
830, 1965 (Fair)	2100*
930, 1965 (Fair)	1650
930, 1968 (Good)	4150
1030, 1966 (Good)	4000*
1175, 1973 (Rough)	5500*

WHITE TRACTORS

2-155, 1979 (Good)	14,000*
2-35, 1980 (Excellent)	4000*

INTERNATIONAL HARVESTER TRACTORS

3588, 1981 (Excellent)	36,500*
H, 1949 (Rough)	550*
H, 1948 (Rough)	450*
M, ldr., 1950 (Fair)	600*
M, 1951 (Fair)	675*
M, 1947 (Fair)	775
Sup. M, 1952 (Good)	1000
W-6, 1950 (Fair)	800*
384, ldr., 1979 (Excellent)	6500*
450, 1957 (Fair)	1100*
560, 1960 (Fair)	1650*
560, 1960 (Rough)	1500*
560, 1959 (Rough)	1000
560, 1960 (Fair)	2300*
656, 1967 (Rough)	2650
656, 1968 (Fair)	2600*
706, 1966 (Fair)	3400*
706, 1965 (Fair)	3750*
766, 1973 (Good)	5700*
806, 1965 (Fair)	3700*
806, 1963 (Rough)	1900*
806, 1965 (Fair)	4100*
806, 1965 (Fair)	5400
806, 1967 (Fair)	5800
856, 1969 (Fair)	5700*
856, 1968 (Fair)	6050*
856, 1968 (Fair)	7000*
966, 1972 (Fair)	5650*
1026, 1970 (Good)	6000*
1066, 1972 (Good)	8800
1206,	5450
1206, 1965 (Fair)	5900*
1456, 1970 (Fair)	6800*
1466, 1976 (Excellent)	9100*

JOHN DEERE TRACTORS

R, 1952 (Fair)	975
70, 1956 (Fair)	900*
620, 1958 (Fair)	1300*
620, 1957 (Fair)	1450*
720, 1959 (Fair)	1350*
730, 1960 (Fair)	1800*
830, 1956 (Fair)	1800*
3010, 1962 (Good)	3100*
3020, 1967 (Fair)	3500
4010, 1963 (Fair)	4750*
4010, 1963 (Good)	3200*
4010, 1963 (Good)	3400*
4020,	3550
4020, 1967 (Fair)	5750*
4020, 1967 (Fair)	6700*
4020, 1966 (Good)	6400
4020, 1965 (Fair)	5900
4020, 1968 (Good)	7000*
4020, 1964 (Good)	5300
4230, 1974 (Good)	13,500*
4430, 1974 (Good)	15,100*
4430, 1974 (Good)	16,500
4440, 1981 (Excellent)	28,000
4630, 1974 (Excellent)	11,500*
4630, 1976 (Good)	14,250*
4630, 1975 (Excellent)	15,300*
5020, 1968 (Fair)	5200
3130, 1976 (Fair)	7500*

COCKSHUTT TRACTORS

40,	375
1650, 1964 (Rough)	2800*

MASSEY-FERGUSON TRACTORS

65, 1960 (Fair)	1625
135, 1967 (Fair)	3150
165, 1968 (Rough)	3175
165, 1970 (Fair)	2950
180, 1967 (Good)	3800
180, 1967 (Rough)	3350
245, 1976 (Fair)	4650
1085,	8500
1085, 1978 (Good)	6700*
1100, 1966 (Good)	3300
1130, 1967 (Fair)	4750*

FORD TRACTORS

8-N, 1947 (Rough)	920
960, 1956 (Fair)	1050*
Fordson-Dexta, 1958 (Rough)	1200
3400, ldr., 1970 (Fair)	2800*

DEUTZ TRACTORS

D-13006, (Fair)	7400*

MINNEAPOLIS-MOLINE TRACTOR

M-670, 1964 (Rough)	2100*

OLIVER TRACTORS

77, 1950 (Fair)	425
1450, 1967 (Fair)	2500*
1600, ldr., 1961 (Fair)	2100
1650, 1964 (Rough)	2300
1800, 1961 (Rough)	2300*
1850, 1965 (Fair)	3000
1855, 1966 (Good)	4250*
1950, 1965 (Fair)	4350*

NOTES

Prices reported are for individual sales at wholesale on "as is," "cash and carry" basis.
Prices reported are NOT averages.

Condition classifications: EXCELLENT means—Engine: in perfect condition, 400 to 600 hours of use; Rubber: 80% tread remaining, no breaks or cracks; Paint: original and bright; General Appearance: excellent.

GOOD means—Engine: good running condition; Rubber: 70% tread remaining, no breaks or cracks; Paint: original paint or a good repaint job; General Appearance: good over-all.

FAIR means—Engine: possibly in need of a minor overhaul to restore; Rubber: 60% tread remaining, some cracking evident in side walls; Paint: only fair, weathered and some rust apparent; General Appearance: worn, some dents, minor parts such as gage covers missing or broken.

ROUGH means—Engine: obviously in need of a major overhaul; Rubber: smooth; Paint: scarred, weathered, rusty, needs painting urgently; General Appearance: dents, ruptures, broken parts, loose wires, some components such as lights broken, missing or inoperative.

DEMONSTRATOR means—used for demonstrating only and in practically new condition.

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March 7, 1982
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Implement & Tractor

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C4725-1 3/24/82

One sales manager's view:

'...keep on talking positively...

In the
Manufacturers Edi
New High-Strengt
Low-Alloy
Steels

March 7, 1982 • Vol. 97 • No. 6

Implement & Tractor

The business magazine of the farm & industrial equipment industry

8: **'Keep on Talking Positively...'** This interview with sales manager Roy Leftridge kicks off a running series of articles we're calling "1982—Year of the Salesman." On the cover: Leftridge (right) gets a look at a quotation developed by salesman Mike Conway.

12: **Dual Rings, Computerized Settlements at Enlow Auction.** Oklahoma enterprise aims at speeding up the processes that go with sale day at any auction company.

16: **Strategies for Uncertain Times.** The Marketing & Management Conference of the Farm & Industrial Equipment Institute digs into several topics connected to one of the basics of the business—efficient production and distribution of parts. Also heard from: a major bank economist on agriculture's outlook and an admiral of the U.S. Navy on the vital matter of sea lanes.

22: **Britain's Smithfield.** The first show of the European farm equipment season focuses attention on some new entrepreneural owners of some long-standing brand names.

42: **Toward More Efficient Tractors.** Deere & Co. called a press conference to show off its new Dyna-Cart, a field machine that will be used to measure tractor performance in varied circumstances.

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INTERTEC PUBLISHING CORP.

what's ahead...

I&T
SINCE 1886

March 7, 1982

INTERNATIONAL HARVESTER will suspend tractor output in the U.S. for two months starting March 8. The layoff will include about 1,500 employees at its Farmall plant in Rock Island, Ill. In addition, about 3,000 other employees at plants supplying Farmall--in Louisville, Ky., East Moline, Ill., Waukesha, Wis., and Melrose Park, Ill. Another 450 workers will be laid off indefinitely at plants in Chicago, Louisville, Indianapolis, Ind., Canton, Ohio, and Springfield, Ohio, because of the cutback.

U.S. RETAIL SALES IN JANUARY showed some ups and downs. Two-wheel-drive tractors over 100 horsepower were up, but other units were down. Total unit sales volume on tractors was up 1 per cent. Self-propelled combines and balers (smaller size) were down, but forage harvesters were up and mower conditioners a little more than even. Here's the January flash report of the Farm & Industrial Equipment Institute:

	Unit Retail Sales--January		
Equipment	1982	1981	Pct. Change
Farm Wheel Tractors:			
2-wheel drive			
40-100 hp	3,526	3,826	- 8.8
Over 100 hp	3,760	3,182	+18.0
Total 2-wheel drive	7,286	7,048	+ 3.4
4-wheel drive	663	825	-19.6
Total tractors	7,949	7,873	+ 1.0
Combines (S-P)	1,374	1,676	-18.0
Balers*	376	442	-14.9
Forage Harvesters**	320	271	+18.1
Mower-Conditioners	639	634	+ 0.8

*Bales under 200 lbs. **Shear-bar type

When issuing each monthly flash report, FIEI warns that because of the seasonal nature of the industry, comparisons of monthly data from one period to another should be done with extreme caution.

FARM OUTLOOK FOR 1982 (some excerpts from the "Economic Review" of the Federal Reserve Bank of Kansas City, by Marvin Duncan, FRB economist): "Export sales are expected to increase from the record $43.8 billion of fiscal 1981 to a range of $44-48 billion in fiscal 1982. The current point estimate forecast is $45.5 billion in sales. The U.S. agricultural trade surplus is expected to increase to $28 billion. Export tonnage is expected to increase by about 10 per cent to 180 million tons after declining slightly in fiscal 1981....

"While income prospects for 1982 are currently gloomy, mid-

(Continued on page 6)

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CONGRESSIONAL INFO SERV
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e magazine of the farm & industrial equipment industry

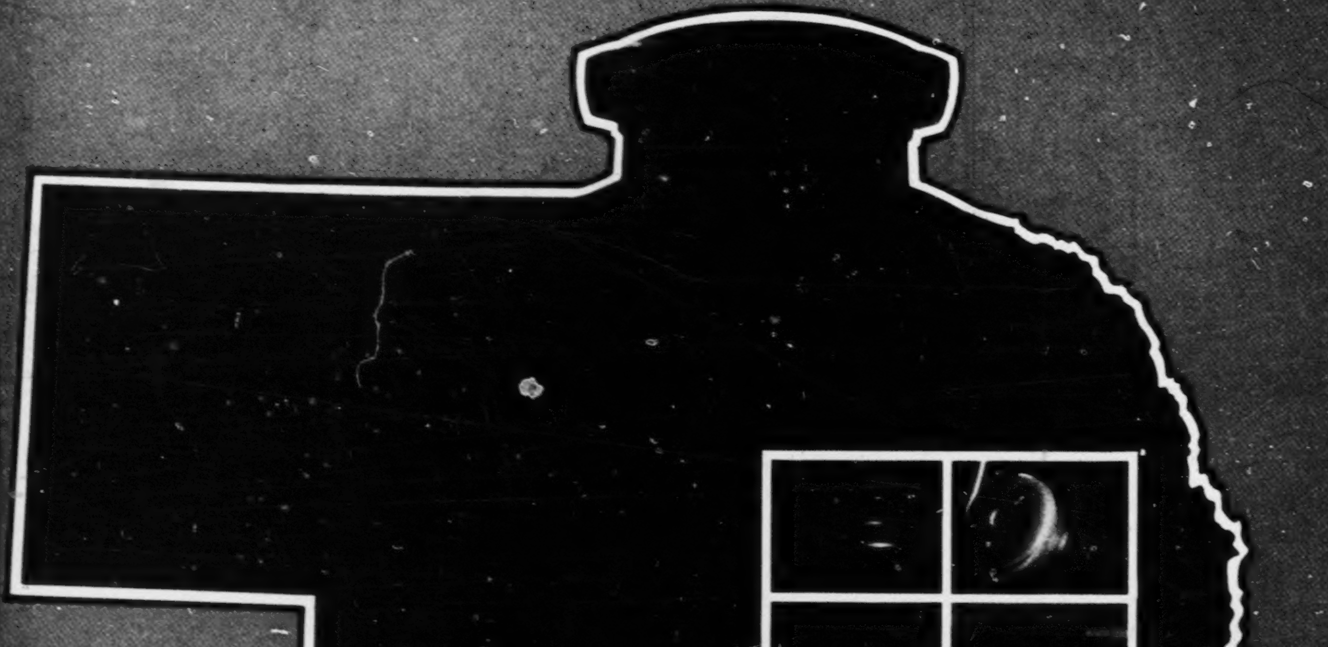
March 21, 1982
TWO DOLLARS

mplement &Tractor

-1 C4725-1 4/1/82

What Nebraska Tests say about the industry's

FUEL EFFICIENCY PROGRESS



Walt Buescher on the Selling Mission page 20

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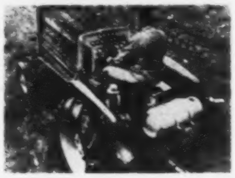
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Regardless of what you see....

...this issue of I&T is not an Allis-Chalmers special. It's just that three articles with A-C connections came into maturity, ready for the press, in time for this issue—a piece about A-C's new line, a report about electric vehicles for farming that recalls that company's experimental fuel-cell tractor of 1959, and some selling wisdom from a retired A-C marketing executive.

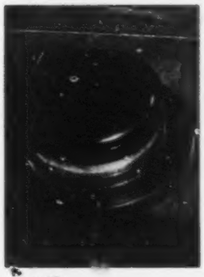
8: **Allis-Chalmers Brings Out New Products.** Major offering is a new line of two-wheel-drive tractors.

14: **Onan's L Series Diesel Engines.** Alabama factory's output could be used in, among other applications, intermediate tractors.

18: **Tractor Fuel Efficiency: Not a Great Track Record.** A by-brand review of Nebraska Test data from 1959 through 1981.

20: **Walt Buescher: Tough Times Mean Opportunity!** Former A-C sales training and sales promotion specialist provides insights as part of I&T's Year of the Salesman special focus.

26: **Future for Electric Tractors?** A study, mandated by Congress, produced a qualified yes. (Waiting for a battery breakthrough.)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On the cover... The topic was fuel efficiency in tractors, so our artist got to playing with snapshots of fuel caps on dealers' lots at Lawrence, Kan.

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RETAIL SALES OF SELECTED FARM EQUIPMENT – Jan.-Dec. 1980 and 1981(1)

(In Units)

	Combines Self-Propelled		Corn Heads		Hay Balers(2)		Windrowers Self-Propelled Power Units		Windrowers Self-Propelled Total Heads		Grinder-Mixers		Shear-Bar Forage Harvesters(3)	
	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981	1980	1981
Alabama	245	261	66	61	153	221	2	.....	1	.....	135	91	37	37
Alaska	5	5	.....	.....	19	14	3	.....	4	.....	1	3	.....	1
Arizona	60	82	7	2	44	50	64	63	76	73	8	7	11	13
Arkansas	672	820	5	4	186	275	.....	5	.....	5	82	44	11	14
California	284	353	53	62	174	162	281	287	311	317	5	6	74	91
Colorado	341	337	158	130	437	395	222	209	237	226	68	56	102	58
Connecticut	.....	1	.....	2	58	55	.....	.....	.....	.....	1	1	42	42
Delaware	43	30	44	32	15	8	1	1	1	1	8	10	12	3
Florida	78	64	51	30	77	86	.....	2	.....	2	46	16	26	34
Georgia	384	458	302	215	197	244	1	.....	1	.....	265	97	105	93
Hawaii	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....
Idaho	440	443	22	14	600	495	404	291	413	306	66	31	75	41
Illinois	2,708	2,734	2,821	2,683	327	246	23	11	23	13	496	365	261	214
Indiana	1,489	1,315	1,615	1,345	316	303	8	8	8	8	390	229	191	128
Iowa	2,928	2,966	3,108	3,182	328	304	137	129	145	141	1,290	954	565	390
Kansas	1,888	1,768	343	209	312	343	290	281	300	298	252	163	263	178
Kentucky	363	364	284	238	292	332	3	27	3	30	306	187	182	159
Louisiana	447	416	3	5	68	121	.....	.....	.....	.....	21	13	19	11
Maine	7	8	.....	4	70	76	2	.....	2	.....	1	2	46	37
Maryland	149	146	171	167	118	90	13	7	14	7	39	27	77	72
Massachusetts	.....	.....	.....	.....	50	45	6	.....	6	.....	3	.....	39	33
Michigan	596	595	566	581	382	286	64	45	65	46	263	181	420	296
Minnesota	1,652	1,819	1,481	1,377	735	673	648	592	666	624	629	536	873	649
Mississippi	543	536	6	15	79	127	2	.....	2	.....	48	38	62	49
Missouri	1,043	1,319	501	430	436	528	86	46	94	48	503	337	191	130
Montana	414	569	7	11	388	285	443	416	491	470	76	52	37	39
Nebraska	1,517	1,497	1,416	1,173	211	185	307	288	321	309	504	362	359	320
Nevada	3	3	.....	.....	40	30	59	49	63	51	2	2	8	7
New Hampshire	.....	.....	.....	.....	58	52	.....	.....	.....	.....	.....	2	34	33
New Jersey	26	19	21	12	41	39	1	.....	1	.....	11	11	17	8
New Mexico	42	50	16	7	128	144	63	61	67	65	12	12	9	6
New York	191	206	243	266	769	588	69	53	70	54	129	117	853	776
North Carolina	419	482	400	420	303	287	2	1	2	1	162	118	96	97
North Dakota	1,014	1,352	58	124	58	69	588	762	639	850	146	111	144	197
Ohio	1,213	868	1,132	864	528	485	9	10	9	10	406	250	269	211
Oklahoma	642	650	23	13	407	504	104	113	111	119	131	84	38	34
Oregon	243	247	10	23	413	323	281	207	301	234	33	23	49	57
Pennsylvania	198	217	291	252	751	670	55	43	57	44	321	230	539	489
Rhode Island	.....	.....	.....	.....	7	2	7	.....	6	.....	.....	.....	1	2
South Carolina	221	221	131	106	85	98	.....	.....	.....	.....	66	38	37	39
South Dakota	513	586	302	291	98	83	538	466	580	524	332	221	395	323
Tennessee	381	458	156	126	389	528	1	2	1	2	207	181	145	147
Texas	974	1,219	303	268	762	1,120	86	93	91	106	250	170	85	84
Utah	40	46	10	5	339	338	131	129	144	135	33	16	99	59
Vermont	1	9	1	14	110	106	4	5	4	5	.....	3	159	115
Virginia	125	159	127	129	393	303	7	10	7	11	97	79	202	164
Washington	460	447	39	50	432	384	195	122	198	149	21	9	146	76
West Virginia	5	3	7	3	166	128	1	.....	1	.....	28	15	31	29
Wisconsin	675	620	832	717	1,481	1,207	394	290	403	300	542	425	1,978	1,499
Wyoming	59	60	14	16	192	210	197	167	213	176	27	20	45	20
U.S. Government	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miscellaneous (4)	.....	3	7	22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
TOTAL	**25,741**	**26,831**	**17,154**	**15,700**	**14,022**	**13,647**	**5,802**	**5,291**	**6,152**	**5,760**	**8,468**	**5,945**	**9,461**	**7,604**

Data released Feb. 22, 1982, Farm & Industrial Equipment Institute.

(1) Includes revisions for prior months.

(2) For making bales of under 200 lbs.

(3) Pull-type, mounted, self-propelled.

(4) Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

Mower Conditioners All Types		Manure Spreaders Conveyor-Type		
1980	1981	1980	1981	
141	172	18	17	Alabama
8	12	1	3	Alaska
12	15	8	6	Arizona
371	474	89	79	Arkansas
45	43	70	63	California
160	141	58	46	Colorado
96	55	64	60	Connecticut
19	10	58	45	Delaware
87	91	31	25	Florida
229	213	47	32	Georgia
.....	.....	1	.....	Hawaii
167	151	137	104	Idaho
606	543	593	477	Illinois
529	495	489	400	Indiana
1,095	977	1,393	1,234	Iowa
638	634	201	137	Kansas
817	917	266	244	Kentucky
48	80	29	16	Louisiana
117	108	113	58	Maine
116	103	215	145	Maryland
53	57	72	58	Massachusetts
685	471	750	634	Michigan
1,062	988	1,537	1,204	Minnesota
101	105	13	17	Mississippi
1,199	1,461	321	252	Missouri
155	168	51	26	Montana
485	463	345	192	Nebraska
9	9	5	4	Nevada
75	56	59	37	New Hampshire
58	39	55	41	New Jersey
23	27	11	8	New Mexico
1,178	1,017	1,545	1,311	New York
285	251	145	103	North Carolina
140	180	107	66	North Dakota
808	632	820	645	Ohio
617	673	57	29	Oklahoma
279	184	112	79	Oregon
934	784	1,222	1,005	Pennsylvania
4	3	.....	.....	Rhode Island
79	135	30	14	South Carolina
91	134	216	175	South Dakota
569	755	156	123	Tennessee
1,120	1,467	144	139	Texas
205	181	118	85	Utah
250	195	223	202	Vermont
674	529	232	137	Virginia
262	201	137	95	Washington
177	152	64	61	West Virginia
2,519	1,895	2,253	1,814	Wisconsin
55	75	37	26	Wyoming
.....	.....	.....	.....	U.S. Government
.....	.....	8	.....	Miscellaneous
19,452	**18,521**	**14,733**	**11,773**	**TOTAL**

INDUSTRY IN MOTION

Marliss Industries, Jonesboro, Ark., announces the addition of two product design engineers—Tony Speer and Mike Spencer. Both men hold BSAE degrees from Arkansas State U. at Jonesboro.

Dickey-john Corp., Auburn, Ill., producer of electronic instrumentation for agriculture, will be marketing on-farm computer systems through its newly formed Agricultural Management/Computer Systems Div. Jack Barber is manager of the new division. Dickey-john has selected the Xerox 820 information processor as the hardware foundation for its system and will supply software as an integral part of their management systems.

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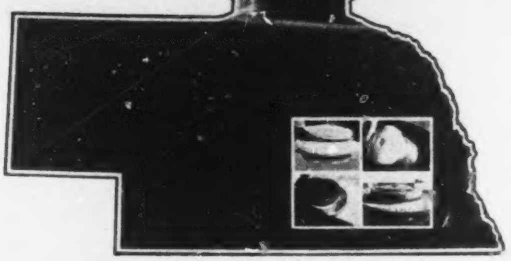

THE INDUSTRY'S TRACTOR FUEL EFFICIENCY: NOT A STRONG TRACK RECORD

I&T's engineering editor studies the Nebraska Tractor Tests and compares horsepower-hours per gallon. Two myths are tucked away —partly, anyway. Would you like to get in on the debate?

By Frank Buckingham

■IT'S BEEN more than eight years since the 1973 oil embargo, the first cries of "fuel shortage," and the start of ever-escalating fuel prices. Fuel in most areas of the country now costs several times what it did just 10 years ago. If we paint the tractor industry with one brush, average fuel efficiency is worse now than it was in the early 1970's. That could be called progress—straight to the rear.

There are a few somewhat brighter spots, though, but a close examination of Nebraska Tractor Tests shows little for the industry to brag about. Such an examination also shoots holes in a few popular myths.

First, let's explain the rules

Initial plans were to compare Nebraska Tractor Tests from the past 10 years with the tests from the 10 years before that—1961-1981. However, due to some changes in test procedures and publication of test results in the *I&T Red Book*, it was more convenient to go back to Jan. 1, 1959. Also, current *Red Books* list 10 years of tests.

So, the 1971 *Red Book* was used for 1959-70 tests, and the 1981 issue for 1971-80 tests. Individual test reports from Nebraska provided 1981 test information.

In that 23 year period, 1959-81, there were 721 tests reported: 185 non-diesel and 536 diesel tractors, including 19 diesel crawlers. However, this study has been limited to wheeled, diesel tractors—517 of them, from less than 20 to more than 400 db hp.

A number of studies show that fuel consumption at 75 per cent of maximum drawbar load in the Nebraska Tractor Test is a reasonable approximation of tractor fuel consumption under load in normal field work. Other studies indicate that average annual fuel consumption for general work can be approximated by using fuel consumption at rated engine speed and 50 per cent of maximum drawbar load. So, these two tests have provided the basis for this study, and we've used hp-hrs/gal. to put all tractors on an equal basis, to show how much work each one can do on a gallon of fuel.

Someone else might pull different figures from these tests and interpret them differently, or even find a different picture in the same figures we've used. But the underlying fact remains that we seem to have made very little progress in tractor fuel efficiency in the past quarter century.

Tabulation

Hp-hrs/gal. at 75 and 50 per cent of maximum drawbar load was tabulated by tractor model, and these figures averaged by manufacturer and for all tractors over five different periods. The results were disappointing, but not totally unexpected. There were, however, some real surprises.

The periods included 1959 through 1970 (called 59-70 tests); 1971 through 1978 (71-78); 1979 through 1981 (79-81); 1971 through 1981 (71-81); and the 23 year average, 1959 through 1981 (59-81 tests).

Readers are welcome to study the figures and rank manufacturers as first, second, last, etc. We've chosen to simply present the data, which largely speaks for itself, and will point out what we believe are some significant features.

Down with myths

We obviously couldn't print figures for all the individual tractor models; space is limited. But examination of that data shot down some seemingly accepted "facts" (myths would be a better term) about tractor fuel efficiency.

Myth No. One: Big tractors are more efficient than smaller tractors. The test results (71-81) show this is not true. The largest tractor in the 10 most efficient (75 per cent drawbar load) was the 250-hp Belarus 7100 four-wheel drive. But the other nine "most efficient" tractors in that period averaged 58.25 maximum db hp, and ranged from 29.66 to 74.46 maximum db hp.

The 10 tractors with the lowest efficiency in that period (71-81) had an average maximum drawbar horsepower of 51.43—with a range of 13.03 to 88.13. So, what hap-

Average Tractor Fuel Efficiency, HP/Hours per Gallon

(Nebraska Tests, 1959-1981, at 75 and 50 Pct. of Drawbar Load)

	1959-1970		1971-1978		1979-1981		1971-1981		1959-1981	
Brand	**75% Max.**	**50% Max.**	**75% Max.**	**50% Max.**	**75% Max.**	**50% Max.**	**75% Max.**	**50% Max.**	**75% Max.**	**50% Max.**
Allis-Chalmers	12.40(12)*	10.64(12)	12.06(18)	10.04(18)	11.87(5)	9.98(5)	12.01(23)	10.03(23)	12.14(35)	10.24(35)
Belarus	.....	.....	13.27(3)	11.69(3)	14.17(2)	12.41(2)	13.63(5)	11.97(5)	13.63(5)	11.97(5)
Big Bud	.....	.....	.....	.....	13.97(1)	12.01(1)	13.97(1)	12.01(1)	13.97(1)	12.01(1)
Case/David Brown	13.02(34)	11.45(34)	12.58(28)	10.98(28)	12.67(14)	11.09(14)	12.61(42)	11.02(42)	12.79(76)	11.21(76)
John Deere	12.17(25)	10.43(25)	11.81(25)	9.96(25)	11.86(13)	10.05(13)	11.82(38)	9.99(38)	11.96(63)	10.17(63)
Deutz	.....	.....	14.12(10)	12.51(10)	13.73(5)	12.04(5)	13.99(15)	12.35(15)	13.99(15)	12.35(15)
FWD Wagner	12.45(2)	11.05(2)	.....	.....	.....	.....	.....	.....	12.45(2)	11.05(2)
Ford	12.67(27)	11.15(27)	12.21(22)	10.51(22)	11.78(5)	10.16(5)	12.13(27)	10.45(27)	12.40(54)	10.80(54)
Hesston-Fiat(a)	11.18(2)	9.22(2)	13.67(4)	11.82(4)	13.46(7)	11.85(7)	13.53(11)	11.84(11)	13.17(13)	11.44(13)
International Harvester	11.84(24)	10.22(24)	11.68(30)	9.92(30)	12.04(18)	10.25(18)	11.82(48)	10.05(48)	11.82(72)	10.10(72)
Kramer	11.40(1)	9.82(1)	.....	.....	.....	.....	.....	.....	11.40(1)	9.82(1)
Kubota	.....	.....	10.85(8)	9.23(8)	11.78(8)	10.20(8)	11.32(16)	9.71(16)	11.32(16)	9.71(16)
Lamborghini	.....	.....	12.74(1)	10.93(1)	.....	.....	12.74(1)	10.93(1)	12.74(1)	10.93(1)
Leyland	.....	.....	12.57(3)	10.68(3)	11.89(2)	10.29(2)	12.30(5)	10.52(5)	12.30(5)	10.52(5)
Long	.....	.....	13.15(4)	11.42(4)	13.12(4)	11.58(4)	13.13(8)	11.50(8)	13.13(8)	11.50(8)
Massey-Ferguson	13.31(20)	11.75(20)	12.75(18)	11.10(18)	11.27(19)	9.51(19)	11.99(37)	10.28(37)	12.45(57)	10.80(57)
Nuffield	13.24(3)	11.86(3)	.....	.....	.....	.....	.....	.....	13.24(3)	11.86(3)
Porsche	10.81(2)	9.46(2)	.....	.....	.....	.....	.....	.....	10.81(2)	9.46(2)
Same	.....	.....	12.61(3)	10.67(3)	.....	.....	12.61(3)	10.67(3)	12.61(3)	10.67(3)
Satoh	.....	.....	.....	.....	11.18(1)	9.58(1)	11.18(1)	9.58(1)	11.18(1)	9.58(1)
Steiger	.....	.....	12.67(14)	10.96(14)	13.06(3)	11.01(3)	12.74(17)	10.97(17)	12.74(17)	10.97(17)
Ursus	12.59(2)	11.72(2)	.....	.....	.....	.....	.....	.....	12.59(2)	11.72(2)
Versatile	.....	.....	.....	.....	12.32(4)	10.11(4)	12.32(4)	10.11(4)	12.32(4)	10.11(4)
White(b)	12.07(31)	10.38(31)	12.23(18)	10.58(18)	11.95(6)	10.33(6)	12.16(24)	10.52(24)	12.11(55)	10.44(55)
Yanmar	.....	.....	11.95(1)	10.37(1)	.....	.....	11.95(1)	10.37(1)	11.95(1)	10.37(1)
Zetor	13.38(5)	11.24(5)	.....	.....	.....	.....	.....	.....	13.38(5)	11.24(5)
Average	**12.50(190)**	**10.87(190)**	**12.31(210)**	**10.58(210)**	**12.20(117)**	**10.47(117)**	**12.27(327)**	**10.54(327)**	**12.35(517)**	**10.66(517)**

*Numbers in parentheses indicate number of tractor tests averaged in that particular figure.

(a) Includes Fiat tests before Hesston-Fiat.

(b) Includes White, Minneapolis-Moline and Oliver tests.

pened to the "efficient big tractors" we've been told about? They don't seem to have been tested at Nebraska in the past 11 years.

Myth No. Two: Foreign tractors are more fuel efficient than American-made models. But that is not necessarily so either. Well, the 10 tractors with highest hp-hrs/gal at 75 per cent drawbar load (71-81) were all foreign-made. So, that still holds water. Those top 10 tractors included three Deutz, two Case-David Browns, two Hesston-Fiats, and one each by Massey-Ferguson, Belarus and Kubota.

But, for reasons we'll explain later, we've chosen to ignore at this point the low efficiency of IH hydrostatic drive tractors (seven of the 10 lowest tested). Then, at 75 per cent drawbar load (71-81) and without the hydrostatics, nine of the 10 *least* efficient tractors were also imports. These included four Kubotas, four Massey-Fergusons, and one Allis-Chalmers—plus a U.S.-made IH, non-hydrostatic.

The 10 most efficient tractors produced almost 50 per cent more work per gallon of fuel than did the lowest 10, including the hydrostatics, and did 40 per cent better than the bottom 10 without hydrostatic drives.

As a matter of interest, "most efficient" 10 is dominated by European models, and the lower 10 (without hydrostatic drive) are mostly Oriental tractors.

Overall, however, the chart indicates that foreign tractor lines generally average more hp-hrs/gal than do those of American companies (even though a number of their smaller models are imports, too). For instance, for the periods

(Continued on page 33)

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Fuel Efficiency

(Continued from page 19)

71-78 and 71-81, Deutz had the highest average efficiency at 75 per cent of drawbar load. However, in the past three years (79-81), Deutz average of 13.73 for five tractors fell below the Belarus average of 14.17 for two tractors, and Big Bud's single test effort of 13.97 (406 max. db hp). But, there aren't enough tractors involved for any of these firms to call the results a trend.

On the other hand, in 71-81 tests (75 per cent load) the least efficient Deutz (13.50 hp-hrs/gal) did more work per gallon of fuel than the top tractors tested by Allis-Chalmers, John Deere, Ford and International Harvester in the same test.

Why performance varies

By now, you may have formulated a number of reasons to rationalize the differences in average performance of various tractor lines. Some are certainly valid, others may be questionable.

Let's face it, European tractor designers have stressed fuel efficiency longer than have American engineers. As recently as five years ago, some American engineers admitted they were devoting very little more effort to fuel efficiency than they had been 10 years earlier. (The chart shows that average efficiency for the industry dropped 1.5 per cent at 75 per cent load and 2.7 per cent at 50 per cent load between the 59-70 and 71-78 periods...all years

(More...)

Fuel Efficiency
(continued)

of cheap fuel or pre-fuel crisis engine designs.)

Is the industry really ignoring engine efficiency? Or, are they just building less efficient tractors? I believe that on the whole, engines are more efficient. But in recent years, we've added more ventilated, air conditioned and heated cabs; more sophisticated hydraulic systems; more power steering, power brakes, hydraulic clutches and more advanced transmissions; plus other features, each of which consume fuel and power. Understandably, not many tractor buyers would be willing to sacrifice many of those features for an increase in fuel efficiency.

Some designers also complain that meeting noise level and pollution regulations also reduces fuel efficiency. So, maybe we're lucky that efficiency hasn't dropped even further below that of tractors built 15 or 20 years ago. Without continual addition of small improvements, it would have.

The transmission used and operating speed certainly influence fuel economy and tractor performance. Most tractors tested in recent years develop maximum drawbar power at speeds above 5 mph, and some have exceeded 7 mph—much higher than in earlier years.

As we said earlier, seven of the 10 tractors with lowest fuel efficiency were IH hydrostatic drives. But even though the Nebraska Tractor Tests are intended to provide unbiased comparisons of different tractors, hydrostatic drives get a bum rap under those test conditions. They simply do not perform efficiently under constant load at constant speed for long periods. And few customers would buy a hydrostatic tractor for such work.

However, hydrostatic drives start paying off when the load, speed and direction of travel change frequently. This means they're ideal for front-end loader operation; for up-and-down hill operation or for frequently varying soil conditions; in stop-and-go work; or to provide optimum travel speed while maintaining constant pto speed. Fuel efficiency under those conditions may equal that of tractors with conventional transmissions, and certainly the comfort and convenience of operation is much better.

So, because hydrostatic drives don't fit the mold of other tractors, we chose to ignore them earlier when discussing the least efficient models. Their performance is, however, included in the IH averages shown in the chart.

So where are those bright spots?

Glancing through the industry averages at the bottom of the chart, we see that tractors tested in the last three years (79-81) were, on the average, less efficient than those tested in any other period. But there may be some turnaround. Belarus, Case-David Brown, John Deere, International Harvester, Kubota and Steiger all posted higher average efficiencies in 79-81 compared with their performances in 71-78. Hesston-Fiat and Long tractors tested in 79-81 showed better efficiency at 50 per cent load, but slightly lower economy at 75 per cent load, both compared with their 71-78 tests.

All these companies have had time since the 1973 fuel crisis to incorporate some engine modifications into recently-tested tractors and to start showing improved fuel efficiency.

With that many firms showing improvement, it's hard to explain why others were down. For instance, in 59-70 tests, Massey-Ferguson averaged 13.31 and 11.75 hp/hrs/gal., respectively, in the 75 and 50 per cent drawbar load tests—right at the top of the heap. By comparison, MF performance in 71-78 was off 11 and 14 per cent, respectively, from their earlier levels in the 75 and 50 per cent tests. But, Massey fuel economy in 79-81, compared with 59-70, slipped further. The MF average for 19 tractors in 79-81 was 15 and 19 per cent below the levels they bragged about in the 1960's. A plunge in efficiency of that magnitude can hardly be used to help boost equipment sales in a very tight market.

Back on the brighter side, International Harvester was one of only two companies whose tractors showed better efficiency in 79-81 than they did in 58-70. IH tractors improved slightly between those periods in spite of the inclusion of two low-efficiency hydrostatics in the later period.

But Hesston-Fiat tractor efficiency rose 20 and 28 per cent in the 75 and 50 per cent tests from 59-70 to 79-81. (Pre-Hesston Fiat tractors are included here.)

Although some White employees only reluctantly acknowledge existance of certain earlier models, White averages includes all White, Minneapolis-Moline and Oliver tractors, 59-81.

Where do we go from here?

The picture changes constantly. Only two IH 50 series tractors were included here. The new Deere four-wheel drives, Ford series 10, new A-C and other IH models will all go to Nebraska later. Versatile, too, has new models coming in 1982. Repeating this study next year might show more improvement for individual companies and the industry as a whole.

Users must consider performance first, and whether a given tractor can get their work done in the time they have available. They must also look at availability of parts and dealer service—will the dealer and manufacturer help him keep that tractor "available" whenever he has work to do? With existing economic and political conditions, tractor makers cannot ignore fuel efficiency. Actually, not many people really ignore it now—it's simply not given a very high priority.

Right now, more fuel is probably being saved by farmers who switched to conservation tillage than can be credited to more efficient tractors. In fact, energy savings are often the main reason farmers give for reducing field trips and changing tillage practices. High costs for fuel and other inputs are forcing farmers to cut corners wherever they can, and they've decided they can't wait on the industry to provide efficient tractors. Of course, they're saving soil and water, too, which they should have been doing already.

What does the industry have to say about this situation? We hope we'll find out. We have asked for manufacturers' comments, and we would also like to hear from other interested individuals. Watch for a later I&T article outlining the other positions on tractor fuel economy.

Send your comments directly to Frank Buckingham, Agri-Business Writing, 6451 E. Skyline Drive, Springfield, Mo. 65804. ☐

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Cub, mo. 1964 (Fair)	1900
Cub, Idr., mo. (Good)	2125
H, 1949 (Fair)	575*
H, (Good)	560
M, 1950 (Fair)	800
M, 1949 (Rough)	575
M, 1952 (Fair)	1175
M, (Good)	725
M, (Good)	825
M, (Fair)	700
Sup. M, (Fair)	1050
W-6, 1949 (Good)	750
140, cult., (Good)	3400
300, 1956 (Good)	875
400, (Good)	1125
400, (Fair)	1025
460, plow, 1957 (Fair)	1850
560, 1959 (Fair)	1850
560, duals, (Fair)	1600
560, 1961 (Fair)	2300*
560, (Good)	1700
656, 1967 (Fair)	2725
656, 1967 (Good)	4200*
706, (Fair)	2575
706 diesel, 1965 (Fair)	4000
706, (Fair)	4275
706, (Fair)	3200*
706 diesel, 1964 (Rough)	3200*
706 diesel, (Fair)	4150*
706 diesel, 1964 (Fair)	2925
756 diesel, 1969 (Good)	7000*
766, (Fair)	6000*
806, 1965 (Fair)	3550
806 diesel, 1965 (Rough)	3700
806 diesel, 1965 (Fair)	3300*
806, (Fair)	2100
806 diesel, 1965 (Fair)	4400
806 diesel, 1965 (Good)	3400*
806 diesel, (Good)	5900
806 diesel, 1964 (Fair)	3850*
856 diesel, 1967 (Rough)	5400*
856 diesel, (Fair)	5850*
856 diesel, 1967 (Good)	6975
966 diesel, (Fair)	8300
1066 diesel, cab, 1973 (Good)	9900*
1456 diesel, duals 1970 (Good)	8000*
1466 diesel, cab, 1974 (Good)	8600*
1466, (Good)	8800*
1468, 1973 (Good)	9200
1586 diesel, 1978 (Excellent)	15,000*
3788, 1981 (Excellent)	34,000*

ALLIS-CHALMERS TRACTORS

G, cult., 1950 (Rough)	1050*
WD, (Fair)	575
WD, (Fair)	550*
D-17, 1961 (Fair)	1675
D-17, 1959 (Fair)	1850
200 diesel, 1972 (Fair)	7600*
210 diesel, (Good)	7900

CASE/DAVID BROWN TRACTORS

990 diesel, 1971 (Rough)	2500*
1200 diesel, 1972 (Fair)	2800*
530, 1958 (Rough)	975
580-B,	7300
830 diesel, (Good)	1650
830 diesel,	1400
830 diesel,	1825*
830 diesel, 1961 (Rough)	1450*
1030 diesel, 1965 (Fair)	4000
1030 diesel, cab, (Good)	3950*
1070 diesel, 1971 (Fair)	6750
1175 diesel, 1975 (Fair)	5700*
1370 diesel,	6800*

OLIVER TRACTORS

1355 diesel, 1972 (Fair)	6700*
1450 diesel, 1965 (Fair)	2975
1555 diesel, 1971 (Good)	5000
1650 diesel, (Fair)	3450*
1800, 1959 (Fair)	2400*
1850, (Fair)	3100*
1855 diesel, (Fair)	5150
1950-turbo, 1966 (Fair)	3700*
2255 diesel, 1974 (Rough)	8250*

WHITE TRACTOR

2-155, 1978 (Fair)	12,000*

JOHN DEERE TRACTORS

A, 1951 (Fair)	500
M, cult., (Good)	925
40, Idr., 1955 (Fair)	1250
60, 1956 (Fair)	1200
60, (Fair)	575
70, 1955 (Rough)	800*
G, (Fair)	1175
440, Idr., (Fair)	2700
620, 1957 (Fair)	1450*
620, 1956 (Fair)	1450*
630, 1957 (Fair)	1550
720 diesel, 1957 (Fair)	1325*
730 diesel, 1957 (Fair)	2100*
730 diesel, 1957 (Fair)	1500*
3010, 1962 (Fair)	2450
3010, (Good)	3600
3020 diesel, 1968 (Good)	7700*
4010, 1962 (Fair)	3175
4010 diesel, 1961 (Fair)	4700*
4010 diesel, 1961 (Fair)	4750*
4020 diesel, 1966 (Fair)	6600*
4020 diesel, 1968 (Good)	7100*
4020 diesel, 1970 (Good)	6650*
4020, 1967 (Good)	6900*
4020 diesel, 1967 (Good)	7000*
4020 diesel, 1967 (Fair)	5400
4020 diesel, 1967 (Good)	6700*
4020 diesel, 1968 (Fair)	7000*
4020 diesel, 1967 (Good)	7400*
4230 diesel, 1972 (Good)	13,100*
4230 diesel, 1975 (Good)	10,900
4430 diesel, 1973 (Fair)	15,250*
4430 diesel, 1973 (Good)	13,000*
4430 diesel, 1974 (Good)	14,000*
4440 diesel, (New)	29,500*
4440 diesel, 1981 (Excellent)	30,000*
4630 diesel, 1974 (Fair)	12,000
4630, cab, (Good)	16,250
5020 diesel, 1968 (Good)	7000*
7520 diesel, (Fair)	9500*
JD 300, Idr., (Fair)	3575

FERGUSON/MASSEY-FERGUSON TRACTORS

50, 1958 (Fair)	1875
135 diesel, 1968 (Fair)	2750*
165 diesel, 1967 (Fair)	2975
165 diesel, 1968 (Fair)	3700
175, 1967 (Fair)	4675
1080 diesel, (Fair)	4050
1085 diesel, 1976 (Fair)	6325
1130 diesel, 1968 (Good)	5100*

COCKSHUTT TRACTORS

560, cult., 1954 (Fair)	1025
560 diesel, 1956 (Rough)	750*
1650,	2700*

FORD TRACTORS

8N, 1950 (Fair)	1000*
8N, (Good)	1275
8N, (Good)	1225
9N, 1944 (Rough)	710
Jub., 1954 (Fair)	1400
800, 1956 (Fair)	1800*
900, 1957 (Fair)	1250*
900, (Fair)	1300
961, (Good)	1875
3400, Idr., (Fair)	3675
3400, Idr., 1969 (Fair)	2925*
3600, 1978 (Fair)	5325
4000, Select-O-Speed, 1968 (Fair)	3600*
6000 diesel, 1963 (Fair)	1250*
8000 diesel, 1969 (Fair)	6500*
9600, 1974 (Fair)	6600
7600, (Fair)	7600

DEUTZ TRACTOR

D-13006, 1975 (Rough)	7000*

MASSEY-HARRIS TRACTORS

44, Idr., (Fair)	675*
44, (Fair)	375

MINNEAPOLIS-MOLINE TRACTORS

M-670, 1964 (Fair)	1800*
M-670 LP, (Fair)	1950*

JONES FARM EQUIPMENT CO.
Dothan, Alabama
February 9, 1982

ALLIS-CHALMERS TRACTORS

7040 diesel, 1978 (Excellent)	12,000
7040 diesel, 1976 (Fair)	6000
XT190 diesel, 1970 (Fair)	3400*
180 diesel, 1976 (Fair)	3000
175 diesel, 1977 (Good)	4900
WC, 1945 (Rough)	50
WC, 1945 (Rough)	90

CASE TRACTORS

1070 diesel, 1973 (Good)	5800
480 diesel, 1966 (Rough)	510
SC, 1948 (Fair)	450

DAVID BROWN TRACTORS

990 diesel, 1968 (Good)	1900*
990 diesel, 1965 (Fair)	700

MASSEY-FERGUSON TRACTORS

1150 diesel, 1971 (Fair)	3750
1130 diesel, 1967 (Good)	4425
1105 diesel, 1976 (Good)	6600
1105 diesel, cab., 1974 (Fair)	3800*
1105 diesel, 1974 (Good)	6700
1105 diesel, 1974 (Excellent)	7100
1100 diesel, 1968 (Good)	4200
1085 diesel, 1977 (Fair)	5300
1080 diesel, 1971 (Good)	4300*
285 diesel, 1976 (Good)	5600
275 diesel, 1977 (Fair)	5550
275 diesel, 1976 (Good)	6100*
265 diesel, 1976 (Good)	6800
245 diesel, 1977 (Good)	4600*
205 diesel, 1979 (Good)	3400*
180 diesel, 1968 (Good)	3500
180 diesel, 1968 (Good)	3400*
180 diesel, 1967 (Fair)	2450
175 diesel, 1973 (Excellent)	5100*
175 diesel, 1972 (Good)	3900*
175 diesel, 1970 (Good)	3950
175 diesel, 1968 (Good)	3450
175 diesel, 1967 (Good)	3450
165 diesel, 1971 (Good)	3750
165 diesel, 1971 (Good)	3700
165 diesel, Idr., 1968 (Excellent)	4600
165 diesel, 1966 (Good)	3300
135 diesel, 1970 (Excellent)	3600
135, 1966 (Fair)	2350
135, 1966 (Good)	3200
135, 1966 (Good)	2750*
130 diesel, 1969 (Rough)	800
130 diesel, 1969 (Fair)	1250
130 diesel, 1969 (Good)	2200
65 diesel, 1963 (Good)	2150
65 diesel, 1962 (Rough)	1350
65 diesel, 1961 (Rough)	1075
50 diesel, Idr., backhoe, 1970 (Good)	4600*
50 diesel, 1962 (Excellent)	2100
50 diesel, 1962 (Excellent)	2150
50 diesel, 1962 (Good)	1300
35 diesel, 1959 (Good)	1000
35, 1958 (Fair)	900
35, 1958 (Good)	1550
TO30, 1953 (Good)	1350
TO30, 1952 (Rough)	350
TO20, 1950 (Good)	1050

FORD-FERGUSON TRACTOR

9N, 1944 (Good)	700

FORD TRACTORS

9600 diesel, 1973 (Excellent)	7000*
8700 diesel, cab, duals, 1978 (Excellent)	13,500*
8600 diesel, 1974 (Good)	5600*
7700 diesel, 1977 (Good)	9200*
7700 diesel, 1977 (Good)	9000
7000 diesel, 1975 (Fair)	4900
7000 diesel, 1974 (Good)	6050
6000 diesel, 1963 (Fair)	950*
5600 diesel, 1978 (Excellent)	9500*
5000 diesel, 1975 (Excellent)	5800
5000 diesel, 1971 (Good)	4700*
5000 diesel, 1970 (Good)	4200
5000 diesel, 1967 (Good)	3850*
5000 diesel, 1966 (Excellent)	4500*
5000 diesel, Select-O-Speed, 1966 (Fair)	2400*
5000 diesel, 1966 (Fair)	3000
4000, 1963 (Good)	1700
3600 diesel, 1975 (Excellent)	5800*
3400 diesel, Idr., 1966 (Excellent)	3750
3000 diesel, 1971 (Good)	3200
3000 diesel, 1971 (Excellent)	3550
3000 diesel, 1970 (Excellent)	3650
3000 diesel, 1966 (Good)	3150
3000 diesel, 1966 (Good)	2800*
3000 diesel, 1966 (Good)	3300*
2600 diesel, 1976 (Good)	4350
2000, 1964 (Good)	2150*
861, 1958 (Good)	1750
850, 1956 (Good)	1600
641, 1961 (Good)	2150
641, 1959 (Good)	1960
550 diesel, backhoe, Idr., 1975 (Excellent)	9250
Maj. diesel, 1953 (Good)	1000*
8N, 1952 (Rough)	675
8N, 1952 (Good)	1350
8N, 1950 (Good)	975
8N, 1949 (Excellent)	1300

INTERNATIONAL HARVESTER TRACTORS

1566, cab, duals, 1975 (Good)	9000*
1066 diesel, 1971 (Excellent)	6400
856 diesel, 1968 (Fair)	3150
766 diesel, 1972 (Good)	6400*
684 diesel, 1978 (Excellent)	7400*
574 diesel, 1972 (Rough)	2000*
544 diesel, 1970 (Good)	2850
504, trencher, bld., 1966 (Good)	1500*
404, 1964 (Good)	1450*
H, silage ldr., 1944 (Good)	725
140, cult., 1961 (Excellent)	3200
100, ldr., bld., 1955 (Good)	1600
Sup. C, cutter, bld., 1954 (Excellent)	1450
Sup. A, cult., plt., 1953 (Excellent)	2200
Sup. A, cult., 1953 (Excellent)	2250
185 Cub Loboy, mo., 1975 (Good)	1250
Cub, cult., 1948 (Good)	1250
Cub, cult., plt., plow, mo., 1948 (Fair)	1075
Cub, cult., 1948 (Excellent)	1600
Cub, mo., 1948 (Good)	1300*
Cub, mo., 1948 (Good)	1025

JOHN DEERE TRACTORS

4440 diesel, 1978 (Excellent)	15,700*
4430 diesel, 1973 (Good)	7100
4020 diesel, 1972 (Good)	6600*
4020 diesel, 1965 (Good)	5200*
3020 diesel, 1970 (Good)	5500*
3020, LP 1965 (Rough)	1900
3020 diesel, 1965 (Excellent)	4900
3020 diesel, 1965 (Good)	3700
3010, 1962 (Rough)	1900*
2030, 1973 (Good)	4300*
2020, 1969 (Excellent)	4400
2020, 1968 (Good)	3300*
2010, ldr., 1962 (Fair)	1100*
1020 diesel, 1968 (Good)	3300
1020 diesel, 1968 (Good)	3500
430, 1958 (Good)	1300*
40, 1953 (Good)	825

KUBOTA TRACTOR

L175 diesel, (Good)	1725

LONG TRACTORS

445 diesel, (Good)	2000*
360 diesel, (Good)	3100*

MINNEAPOLIS-MOLINE TRACTORS

G1355 diesel, 1973 (Good)	5600
Jet Star 3 diesel, 1967 (Fair)	1125

OLIVER TRACTORS

2155 diesel, duals, 1977 (Fair)	4000
2150 diesel, 1969 (Fair)	3100
2-150 diesel, 1976 (Good)	10,750
1755 diesel, 1974 (Good)	4700
1655 diesel, 1971 (Good)	4600
1550 diesel, 1966 (Rough)	1000

NOTES

Prices reported are for individual sales at wholesale on "as is," "cash and carry" basis.

Prices reported are NOT averages.

Condition classifications: EXCELLENT means—Engine: in perfect condition, 400 to 600 hours of use; Rubber: 80% tread remaining, no breaks or cracks; Paint: original and bright; General Appearance: excellent.

GOOD means—Engine: good running condition; Rubber: 70% tread remaining, no breaks or cracks; Paint: original paint or a good repaint job; General Appearance: good over-all.

FAIR means—Engine: possibly in need of a minor overhaul to restore; Rubber: 60% tread remaining, some cracking evident in side walls; Paint: only fair, weathered and some rust apparent; General Appearance: worn, some dents, minor parts such as gage covers missing or broken.

ROUGH means—Engine: obviously in need of a major overhaul; Rubber: smooth; Paint: scarred, weathered, rusty, needs painting urgently; General Appearance: dents, ruptures, broken parts, loose wires, some components such as lights broken, missing or inoperative.

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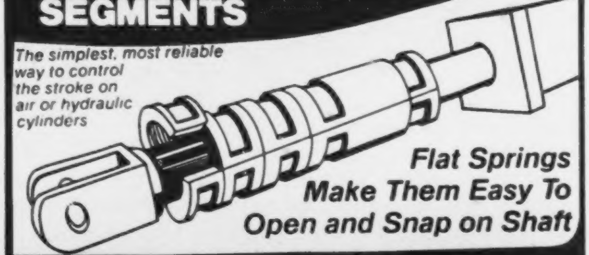

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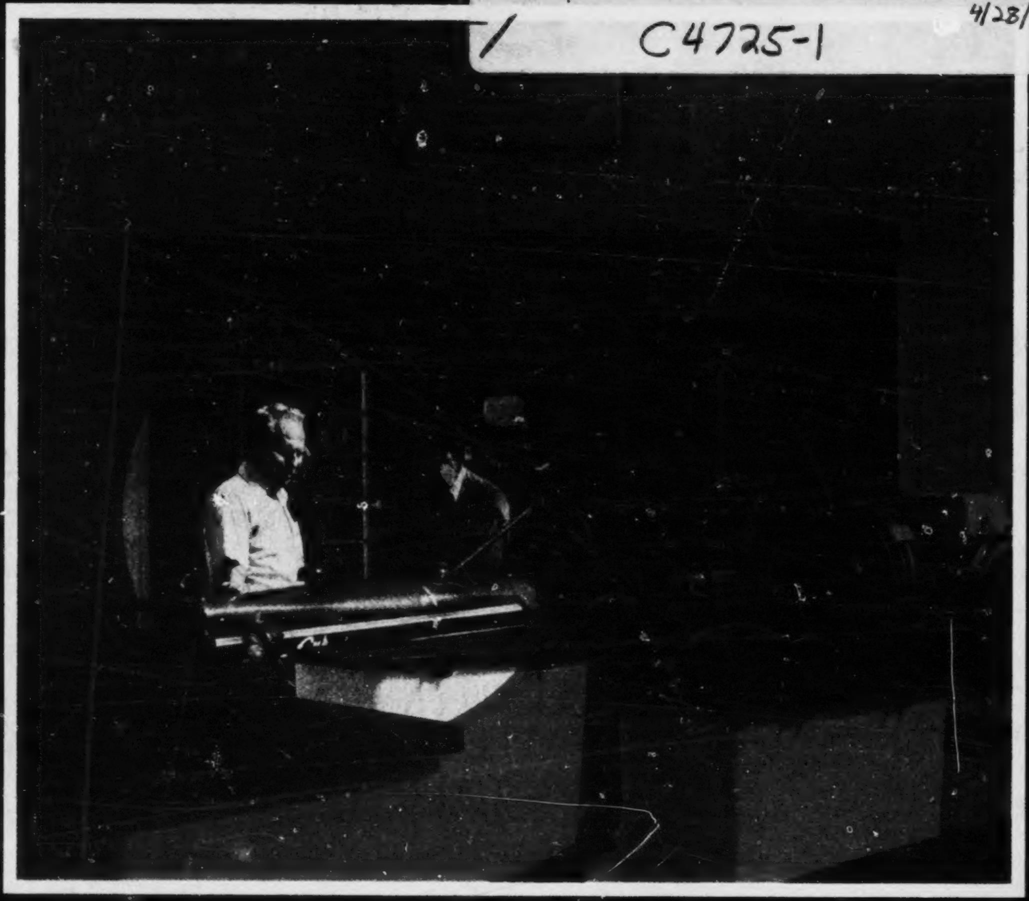

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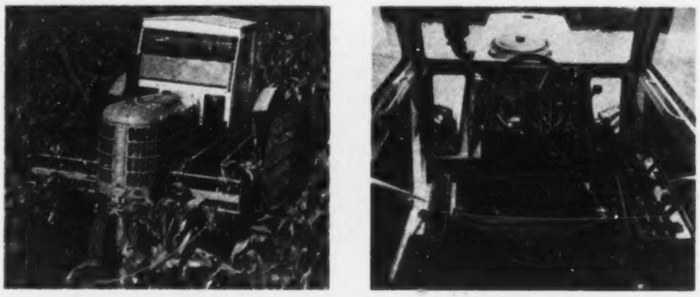

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8 **Taking the Word to Congress.** One manufacturer, as spokesman for FIEI, addresses a Senate committee concerning agribusiness's plight, reports on 176 executives' views on economic recovery.

More Focus on "Year of the Salesman"

12 **How Salesmen Make It at Glade & Grove Supply.** In southern Florida, George Cooper, Jr., instructs his salesmen in "nailing down some cash" early in discussions with prospects. First thing for a salesman to learn: persistence.

16 **A Sales Prospect or Not? How Do You Really Know?** Walt Buescher considers the human tendency to accept passively the assertion that "farmers aren't buying anything right now." An insistent salesman can make things happen.

24 **How Well Do Today's Tractor Cabs Handle Heat and Dust?** A review of a pair of ASAE reports by research engineers from Sweden and Canada shows that, far as we've come, more progress can be made.

On the cover: Salesman (left) and customer at Glade & Grove Supply, Princeton, Fla. Perhaps the most familiar scene of this business, it's also the most critical.

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what's ahead...

April 7, 1982

RETAIL FARM EQUIPMENT SALES IN THE U.S. THROUGH FEBRUARY, according to the Farm & Industrial Equipment Institute flash report, were down severely from the same period of 1981. However, midwinter sales reports are not generally considered a strong barometer of later sales results. The numbers:

	Unit Retail Sales					
	February			January-February		
	1982	1981	Pct. Change	1982	1981	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
40-100 hp	2,658	2,981	-10.8	6,084	6,847	-11.1
Over 100 hp	2,241	2,454	- 8.7	5,999	5,636	+ 6.4
Total 2-wheel drive	4,899	5,435	- 9.9	12,083	12,483	- 3.2
4-wheel drive	568	613	- 7.3	1,230	1,438	-14.5
Total Tractors	5,467	6,048	- 9.6	13,313	13,921	- 4.4
Combines (S-P)	509	1,015	-49.9	1,883	2,691	-30.0
Balers*	199	416	-52.2	595	858	-30.7
Forage Harvesters**	124	173	-28.3	444	444	0.0
Mower-Conditioners	366	530	-30.9	1,006	1,164	-13.6

*Bales under 200 lbs. **Shear-bar type.

CANADIAN RETAIL SALES in the first two months presented even heavier declines. However, the first two months of 1981 were stronger months there than in the U.S., so the current weak sales picture was in stronger contrast. (Source: Canadian Farm & Industrial Equipment Institute)

	February			January-February		
	1982	1981	Pct. Change	1982	1981	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
40-100 hp	502	545	- 7.9	1,026	1,278	-19.7
Over 100 hp	281	460	-38.9	859	939	- 8.5
4-wheel drive						
Under 200 hp	63	137	-54.0	202	278	-27.3
Over 200 hp	63	126	-50.0	199	197	+ 1.0
Total Tractors	909	1,268	-28.3	2,286	2,692	-15.0
Combines (S-P)	57	137	-58.4	232	362	-35.9
Combines (pull)	28	97	-71.1	56	317	-82.3
Balers, Square	50	85	-41.2	125	177	-29.4
Balers, Round	53	88	-39.8	122	205	-40.5
Forage Harvesters*	16	33	-51.5	49	83	-41.0
Mower-Conditioners	51	78	-34.6	119	189	-37.0
Swathers (pull)	29	27	+ 7.4	127	141	- 9.9
Swathers (S-P)	35	66	-47.0	153	180	-15.0

*Shear-bar type.

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EDITOR'S NOTEBOOK

Bill Fogarty

Replacing the Dropped-Out Dealers: How?

The Farm Equipment Manufacturers Assn. recently completed its second round of surveys concerning dealerships going out of business. FEMA's respondents consisted of managers of 26 of the 32 state, provincial and regional independent associations in North America.

The first survey was taken six months earlier. Here's what the two studies turned up:

Number of Dealerships Out of Business, 1981

Dealer's Major Line	1st Six Months	2nd Six Months	Total
A-C	22	19	41
Case	17½	10	27½
Deere	14½	13	27½
Deutz	5	1	6
Ford	37	22	59
IHC	46	59	105
Kubota	1	2	3
M-F	23	39	62
White	13	17	30
Short-lines	10	19	29
Not identified	20	16	36
Total	209	217	426

How do you react to these numbers? My first reaction is that there were fewer fold-ups in the second half of the year than many of us had expected. The worry was that as more notes came due on dealer inventory, more dealers would have to hang it up. However, the second-half going-out rate ran about the same as the first.

Apparently, efforts by manufacturers to clean out their own inventories, which were increasingly intense in the second half of the year, generated some cash flow for dealers that probably made the difference in many cases. Similarly, extensions were granted to dealers when due dates approached on many machines. Apparently, expensive interest charges were not as troublesome as the potential loss of some dealerships.

Of course, the big question remains: Who picks up the slack? Where will the capital and the talent come from that will fill the 426 market areas represented.

Presumably, some of these slots have already been filled—either by new ownership, a company store or some combination of manufacturer and dealer capital—and some have been deemed so marginal as not to warrant replacement.

However, major manufacturers' field representatives are looking at the difficult task of replacing many of those dealerships. The alternative is to surrender a large part of the market shares that were produced through them.

And for each major company blockman who's scuffling to interest some new capital and talent in the retail farm equipment business, how many shortline representatives are out there trying to find new homes for the product?

How are they going to do it?

Experienced dealers I've talked to lately have told me that while there are many farmers today with financial problems severe enough to scratch them off prospect lists temporarily, there are others who are in pretty good shape. Essentially, they managed to avoid getting into the debt crunch; for them, farm prices are bad but can be weathered.

Thus, these dealers tell me, those farmers are tending to sit tight. Their money is in CDs and other high-yield investments. It takes some powerful motivating to get them to shift their capital from such safe nests into more productive farm machinery. *But some of that motivating is getting done.*

I mention this because I wonder if there aren't some dealers in the same situation. It's true that many dealers are doing everything they can just to keep their heads above water. But aren't there others who managed to get their facilities expanded and paid for in time to avoid the high-interest crunch? Aren't there some who learned the trick of sustaining strong earnings in parts and service operations during tough times and are still making money?

I'm sure there are some. Maybe they could be motivated to go to the bank and use some of that money to expand their trade territories or even take over a defunct dealership location. But that, too, would take some powerful motivating in today's climate.

One wonders, then, what major, intermediate and small manufacturers are doing to help their territory people motivate dealers to involve themselves more deeply in a troubled industry. The companies have been conducting intense campaigns to move inventories and get out from under those burdensome bank charges. But what are they doing to persuade prospective new dealers or already existing dealers that their capital has a future in this business?

What's Most Important for Economic Recovery?
(Rankings by 176 executives of FIEI member companies)

	Per Cent of Respondents						
Action Indicated	**No. 1**	**No. 2**	**No. 3**	**No. 4**	**No. 5**	**No. 6**	**No. 7**
Reduce interest rates	46.2	24.3	12.4	5.4	4.5	3.5	3.6
More spending cuts	24.3	29.0	18.4	10.1	9.1	3.5	1.2
Balanced budget	14.2	10.6	5.3	19.0	11.4	17.4	25.9
Loosening money supply	5.3	14.8	12.4	11.3	12.5	15.1	17.6
More business investment	4.7	8.3	24.3	24.4	17.0	10.5	17.6
Preserving personal tax cuts	3.5	8.3	14.8	15.5	23.9	22.1	17.6
Reducing federal budget	1.8	4.7	12.4	14.3	21.6	27.9	16.5

Taking the word to Congress

Manufacturer, as FIEI spokesman, and two dealers illustrate the current plight of agribusiness before Congressional committees.

■"FRANKLY speaking, Mr. Chairman, the nation's farmers and ranchers are in dire economic straits and we believe it's time for the farmer's friends to stand up and be counted."

Speaking was a farm equipment manufacturer, Robert P. White, chief executive officer of Van Dale, Inc., Long Lake, Minn. He was one of several industry people taking their case as agricultural suppliers to the U.S. Congress as it was conducting hearings in February and March. White testified before the Senate Committee on the Budget. He continued:

"Though we try hard to deny it, the most significant economic thrust to our nation's success is still the relative prosperity of our farms and ranches. When the nation's largest industry cannot pay its bills from current cash flow, and has not been able to do so for two years, the entire economy goes into convulsions just as we are experiencing today. Our total economy will not begin a long-term recovery until agriculture begins to enjoy again a modicum of prosperity."

Emphasized White: "Agricultural prosperity will not occur until the prices farmers receive for their products are free from (1) national policies designed to use agricultural overproduction as a means of fighting inflation (done at farmers' expense); (2) policies which commandeer farmers' resources as tools for foreign policy (also at farmers' expense); (3) inflation rates that drive up the inputs they must purchase; and (4) interest rates that are so high as to create a severe short-term financial emergency and threaten the long-term economic viability of our nation's most important resource."

White, appearing on behalf of the Farm & Industrial Equipment Institute, noted that prices farmers have had to pay for their production inputs have increased sharply in relation to income. "Prices of inputs," he explained, *"had built-in inflation escalators* and the prices farmers received did not! And who benefitted? In the short term, everyone who consumed food, except the farmer and those who supply inputs to him.

"In the long-term, however, no one, because such economic inequity to as large a segment of our economy as agriculture brings undesirable results to the *total* economy and ultimately creates much higher-priced food, and perhaps, limited future food supplies."

As FIEI spokesman, White recommended the following six actions be taken:

1. The farming community needs an immediate infusion of low-cost loans.

2. Some controls on 1982 and 1983 production of non-regulated commodities.

3. Demand an immediate removal by Japan of tariffs and any other restrictions that inflate the cost of U.S. foodstuffs or commodities to Japanese consumers.

4. Sell whatever volume of commodities, etc., to the USSR and other Eastern Bloc countries for which they are willing to pay cash on delivery.

5. Use grain embargoes or commodity-related sanctions only as the *last resort*...and be sure even then that farmers do not carry the full economic brunt of that effort.

6. Implement government policies that reduce inflation, lower interest rates and move to reduce the size of

(More...)

the Federal government.

FIEI members surveyed concerning the economy

White told the budget committee what had been produced by a telephone survey of 176 industry executives, as conducted by the FIEI.

When asked about the foreseeable economic future:

- 26 per cent believe we have reached the low point and improvement is now on the horizon;
- 55 per cent believe we are in for a slightly worsening economic situation;
- 16 per cent think we are in for a significantly worsening economic situation.

Asked to pick which they thought to be America's most severe economic problem:

- 48 per cent said high interest rates;
- 33 per cent indicated the Federal budget deficit;
- 19 per cent identified inflation.

What action would best enhance economic recovery?

- 46 per cent said, "Reduce interest rates."
- 24 per cent said, "Make more spending cuts."
- 14 per cent said, "Balance the budget."

Asked if they agreed with Federal Reserve Chairman Volker that a restrictive monetary policy enforced by the Federal Reserve is the best way to fight inflation, and that lowering the budget deficit is the best way to bring down high interest rates, 71 per cent agreed, 29 per cent disagreed.

Should Congress go along with the President's economic recovery program as presented in his 1983 budget?

- 60 per cent said yes;
- 40 per cent said no.

Some of those who disagreed indicated that they agreed in concept but could not go along with the high deficit.

Another question: What is the absolute maximum 1983 budget deficit that is acceptable? The answers ranged from "balanced budget" to $150 billion or more. Here's how they broke down:

Fifty billion—22 per cent; balanced—19 per cent; 18 per cent—$80 billion; 13 per cent—$70 billion; 10 per cent—$35 billion; 8 per cent—$100 billion; 5 per cent—$125 billion; 4 per cent—$90 billion; and under 1 per cent each for $150 billion and "long-term balanced budget."

Finally, 44 per cent of the respondents felt that the U.S. should continue on the President's current economic recovery program. Another 31 per cent said we should make moderate policy changes and try for a more gradual adjustment to reducing the budget deficit's size. Only 2 per cent called for drastic change in economic policy and accept higher inflation. And 23 per cent said we should cut projected spending, especially defense, rescinding all or part of the tax cuts to reduce the deficit.

Dealers from Arkansas, Mississippi Discuss FHA

Two dealers from the Mid-South region appeared before House of Representatives agriculture subcommittees looking into current credit conditions in U.S. agriculture. They

(Continued on page 29)

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REMOTE ALARM SYSTEMS from "ON ENGINE" INSTRUMENTS

Circle (5) on Reply Card

Testifying

(Continued from page 10)

were Albert T. Watson, general manager, Delta Implement Co., Leland, Miss., and Blue Riggan, president of Corning Implement Co., Corning, Ark. Here's part of what they had to say:

Riggan: "My farmer customers are experiencing the same problems most other businesses are facing today—high interest rates, higher and higher production costs, low commodity prices....The quick cure to these problems would be higher prices for the crops they have to sell. We all know this cannot be done in a short period of time; the realistic answer is to gamble a little more and try to hang on, hoping for better times ahead.

"As a dealer, we have always tried to work with farmers to help them in times of tight money by deferring payment of repair parts, and extending machinery payments from December until crops are sold or crop loans are received. As of Feb. 8, accounts receivable were $294,410 and past due machinery payments would run into several million dollars.

No FHA loans

"Most of the people who owe these bills are financed by Farmers Home Administration. Each year the crop is in and counted by no later than Dec. 1. The winter months then give the farmer time to make arrangements for next year—buying seed, chemicals, fertilizer, fuel, repairs and equipment to produce his crop. As of Feb. 10, farmers financing with FHA in Clay County, Ark., hadn't received one cent to pay bills for last year or buy supplies for next year. Some farmers don't know if they will farm at all until June....I am sure this process could be speeded up by some closer management.

"In Corning, the farmers have three crop loan sources: the local bank, the PCA or the FHA. Our local FHA office finance crop loans for 206 farmers under present guidelines. By Oct. 1, 1982, they will drop 147 of these farmers. The other two sources won't be able to absorb more than 20-25 per cent of these farmers; the other 110 will be out of business.

"I don't feel a one-year moratorium on closing out farmers is the answer. Not all people can manage a business, and some farmers could find alternate sources. I suggest moving 25 per cent to alternate financing; 12-15 per cent would probably be out of business, but this would be a buildup of approximately four years that FHA has not had any closeouts. The other 50-60 per cent I hope will be carried by FHA until they can begin to show a profit."

Dealers jeopardized

Watson: "We as farm equipment dealers have been put in jeopardy by FHA policies. I'll give you some ex-

(More...)

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Circle (27) on Reply Card

Testifying
(continued)

amples:

"1. At present, we have $3.77 million in past due notes secured by farm equipment, owed to us by farmers who are furnished by FHA. An undetermined amount of this will be repossessed dependent on whether the farmer is able to negotiate a crop furnish loan for 1982. And 105 farmers furnished by FHA owe us $205,233 for repair parts and service work, which we are unable to collect until each farmer is able to make his arrangement with FHA.

"2. In addition to this indebtedness, we have already repossessed $415,114 worth of farm machinery since the 1981 harvest from farmers furnished by FHA.

"3. When a farmer is making arrangements for his 1982 crop loan, FHA policy appears to be to refuse to pay anything on his outstanding farm equipment indebtedness or his repair accounts....

"4. At present, 57 per cent of our repair accounts are more than 30 days past due. Our standard is not to exceed 25 per cent in past due accounts. These past due accounts put a tremendous strain on our capital, as we must pay cash for our parts purchases. The majority of these past due repair accounts are farmers who are furnished by FHA. There appears to be inadequate money set up in the FHA furnish loans to allow the farmers to make necessary repairs. As a result, we end up carrying accounts past due or we must refuse to sell repair parts on credit....

"We are in a very critical time in our farm related industry. Survival in 1982 will depend in large measure on quick, direct assistance to these farmers, with clear guidelines to local FHA supervisors." ☐

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April 21, 1982
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A straight-ahead look at

TRACTOR INVENTORIES

TRACTOR SALES (by HP)

TRACTORS ON THE MARKET

Sharp Shop Ideas page 12

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INTERTEC PUBLISHING CORP.

Implement &Tractor

The business magazine of the farm & industrial equipment industry
April 21, 1982 • Vol. 97 • No. 10

A Straight-Ahead Look at
Tractor Inventories, Tractor Sales by Horsepower, and Tractor Models on the North American Market

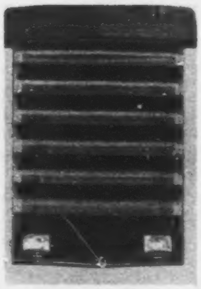
10: **How Do Industry Inventories Look Today?** I&T takes FIEI inventory data, quarterly for five years plus, and makes some comparisons with sales performance—and also with what was considered to be "acceptable" levels a few years back.

16: **Where the Horsepower Sales Went in 1981.** This annual feature, also from FIEI's reporting program, shows tractor unit sales by state and by horsepower bracket. Text makes a rough estimate of total units of horsepower sold.

18: **Tractors on the North American Market.** What are the choices if your customer is seeking a 42-hp tractor? Or what if you're a dealer looking for something to fill a gap in your line. It's all here at a glance, by make and model.

12: **Sharp Shop Ideas.** Contributor Glenn Hensley's camera probes the shop of every dealer he visits, looking for practical improvements to service department efficiency. Here are several.

20: **Help Your Customers Sell Their Products—You'll Sell, Too.** Walt Buescher, our "Year of the Salesman" contributor, demonstrates that it's possible to create a need for your product even in "impossible" circumstances.



On the cover... Since we were taking a straight-ahead look at tractors, we dug out this straight-ahead photo of a Versatile 1150. Speaking of inventories, Versatile has told I&T that it sold out its first production run of 1150s.

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I&T
SINCE 1886

AUCTION PRICES OF USED EQUIPMENT

An exclusive I&T monthly report of actual prices paid recently at these leading national wholesale auctions.

Asterisk beside tractor price indicates highest bid offered on tractors which were not sold.

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Dothan, Alabama
March 9, 1982

ALLIS-CHALMERS TRACTORS

5040 diesel, 1977 (Fair)	3250
WD, cult., plow, 1950 (Good)	875
WD, 1949 (Rough)	200

CASE TRACTORS

1070 diesel, cab, 1972 (Excellent)	7400*
580 diesel, ldr., backhoe, 1968 (Fair)	3000
450 diesel, ldr., (Good)	4700*

DEUTZ TRACTORS

9006 diesel, 1972 (Fair)	3100
4005 diesel, 1973 (Rough)	1100*

DAVID BROWN TRACTOR

990 diesel, 1968 (Good)	1600

MASSEY-FERGUSON TRACTORS

2745 diesel, 1978 (Good)	10,800
1105 diesel, 1977 (Excellent)	7700
1105 diesel, 1974 (Good)	6500
285 diesel, 1979 (Excellent)	7750
275 diesel, 1977 (Good)	6250
265 diesel, 1979 (Good)	5850
265 diesel, 1977 (Fair)	4300
265 diesel, 1975 (Good)	5950
255 diesel, 1975 (Good)	5000
245 diesel, 1978 (Excellent)	6050
235 diesel, 1975 (Excellent)	5200
235 diesel, 1975 (Good)	4950*
180 diesel, 1968 (Good)	3250*
180 diesel, 1968 (Good)	3350*
180 diesel, 1968 (Good)	3150*
175 diesel, 1972 (Rough)	2250
175 diesel, 1970 (Good)	3700
175 diesel, 1970 (Good)	3500*
175 diesel, 1966 (Good)	3400
3165, 1968 (Rough)	1975
165 diesel, 1966 (Good)	3350*
165 diesel, 1967 (Good)	3400*
165 diesel, 1967 (Good)	3400*
165 diesel, 1968 (Good)	3600
165 diesel, 1967 (Good)	3450
165 diesel, 1966 (Good)	3250*
205 diesel, 1979 (Good)	3500*
135 diesel, 1970 (Fair)	2800*
135 diesel, 1970 (Good)	3250
135, 1967 (Fair)	2500
135 diesel, 1966 (Fair)	2700*
135, 1966 (Good)	3200
135 diesel, 1965 (Fair)	2500*
135 diesel, 1965 (Good)	3250
130 diesel, 1969 (Good)	2750
65, 1963 (Rough)	825
65, diesel, 1963 (Good)	2100*
50 diesel, 1967 (Good)	1650
35 diesel, 1962 (Fair)	1450
35 diesel, 1959 (Good)	1800*
T030, 1953 (Good)	1175
T030, 1953 (Good)	925
T030, 1952 (Good)	1100

FORD TRACTORS

9600 diesel, 1973 (Good)	6000
9000 diesel, 1972 (Fair)	3600*
8000 diesel, cab, 1972 (Fair)	3900*
7700 diesel, cab, 1977 (Good)	9100
5000 diesel, 1970 (Good)	4100*
5000 diesel, 1969 (Good)	3900*
5000 diesel, 1966 (Fair)	3200
5000 diesel, 1966 (Fair)	3100
4000 diesel, 1970 (Good)	3750*
4000 diesel, 1966 (Fair)	3000*
4000 diesel, 1966 (Fair)	3200
3000 diesel, 1967 (Good)	2750*
3000 diesel, 1966 (Fair)	2300*
3000 diesel, 1966 (Fair)	2000
3000 diesel, 1966 (Fair)	2100*
3000 diesel, 1966 (Good)	3450
2000 diesel, 1963 (Good)	2150
2000, 1963 (Good)	1900
2000, 1963 (Good)	2100*
1900 diesel, 1979 (Excellent)	4700*
961 diesel, 1958 (Good)	1150
861, 1958 (Good)	1900*
850, 1956 (Fair)	1350
Maj. diesel, 1953 (Fair)	400
Sup. Dex., 1963 (Excellent)	2200
640, 1956 (Fair)	1100*
Jub., 1953 (Good)	1600
8N, ldr., 1952 (Good)	1500*
8N, 1952 (Excellent)	1900
8N, 1951 (Good)	1300
8N, 1950 (Excellent)	1600
8N, 1950 (Good)	1175
8N, 1948 (Good)	1300

INTERNATIONAL HARVESTER TRACTORS

1086 diesel, 1977 (Excellent)	13,000
986 diesel, 1976 (Good)	9400
966 diesel, 1974 (Good)	7000
706 diesel, 1963 (Good)	3500*
2400 diesel, 1971 (Good)	2200
664 diesel, (Fair)	2450*
634 diesel, (Fair)	2700
544 diesel, 1968 (Fair)	2000*
504 diesel, 1966 (Fair)	1200
460 diesel, 1962 (Good)	1850
424, 1965 (Good)	2350
414 diesel, 1959 (Good)	900
404, 1964 (Good)	1600
340, 1961 (Good)	1000
M, 1942 (Fair)	270
H, cult., 1946 (Good)	450
Sup. C, 1951 (Good)	500
Sup. A, 1952 (Good)	850
Sup. A, cult., 1952 (Excellent)	1950
Sup. A, cult., plt., 1952 (Good)	950
140, cult., 1967 (Excellent)	3500*
140, cult., 1967 (Excellent)	3400*

JOHN DEERE TRACTORS

4630 diesel, cab, duals, 1976 (Excellent)	13,000*
4840 diesel, cab, duals, 1978 (Excellent)	26,000*
4520 diesel, 1969 (Fair)	5000*
4440 diesel, cab, duals, 1978 (Excellent)	18,500
4430 diesel, 1973 (Excellent)	10,400
4020 diesel, 1968 (Good)	4900*
3010 diesel, 1962 (Good)	2500*
2630 diesel, 1974 (Good)	5400*
2030 diesel, 1973 (Good)	4350*
2030 diesel, 1973 (Fair)	3050
2030 diesel, 1973 (Good)	3900
2020 diesel, 1967 (Fair)	3150*
1120 diesel, 1975 (Excellent)	3400*
1020 diesel, 1967 (Good)	2850
1010, 1961 (Fair)	875
830 diesel, 1975 (Good)	4100*
430, 1958 (Fair)	1100
301A, diesel, 1975 (Fair)	1800*
80 diesel, 1955 (Rough)	375
A, 1950 (Rough)	290
B, 1948 (Rough)	225
B, 1948 (Fair)	400
B, 1948 (Fair)	400
M, cult., 1951 (Fair)	450*

KUBOTA TRACTOR

L260 diesel, 1972 (Good)	1900

LONG TRACTORS

560 diesel, (Good)	3700
510 diesel, (Good)	4800*
460 diesel, (Fair)	2200

LEYLAND TRACTOR

154, 1975 (Good)	2200

MASSEY-HARRIS TRACTOR

33, 1953 (Fair)	175

OLIVER TRACTORS

2-150 diesel, 1975 (Good)	7800*
55 diesel, 1955 (Good)	1250

YODER & FREY, INC.
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March 3 & 9, 1982

INTERNATIONAL HARVESTER TRACTORS

A, cult, 1950 (Fair)	1725
A, plow, cult.,	1100
A, 1949 (Rough)	475
Cub 154, mo., pl., bld., (Good)	1850
Cub Lo-Boy, 1949 (Good)	925*
Cub Lo-Boy, mo., (Fair)	1725
H, 1946 (Fair)	700
H, 1949 (Fair)	825
H, ldr., 1951 (Fair)	650
SH, 1952 (Good)	775
M, 1948 (Fair)	635
M, 1950 (Fair)	725
M, 1951 (Fair)	960
M, 1950 (Fair)	885
M, 1950 (Fair)	975
Sup. M, 1953 (Fair)	975
Sup. M, 1953 (Fair)	925*
Sup. M, 1954 (Good)	1200
Sup. M, 1952 (Fair)	1000
140, (Fair)	2450
240, 1962 (Fair)	1300
300, 1957 (Fair)	750
300, plow, 1958 (Fair)	1500
340, 1956 (Rough)	1275
350, ldr., 1977 (Fair)	3700*
400, 1955 (Rough)	1450
400 diesel, 1951 (Fair)	1425
400, 1956 (Fair)	1025
400, 1956 (Rough)	775
400, 1957 (Fair)	1050
400, 1956 (Rough)	1225
460 diesel, 1961 (Fair)	2200
464, ldr., 1979 (Good)	5100*
504, 1974 (Good)	2850*
504 diesel, 1966 (Fair)	2950
560, 1960 (Fair)	1800*
560 diesel, 1960 (Rough)	1350
560, 1960 (Fair)	1600
574, 1971 (Good)	4675
574, 1975 (Good)	5500*
656, ldr., 1966 (Good)	3700
674, 1978 (Good)	6100*
686, 1978 (Good)	7300
706 diesel, 1964 (Fair)	4200
706, 1965 (Good)	3000
706 diesel, 1963 (Rough)	3100*
706, 1963 (Good)	2875
756, 1968 (Good)	4600*
756 diesel, 1970 (Good)	5700
756,	4150
766, 1975 (Good)	5800
766, 1974 (Good)	8100
806, 1966 (Good)	3350*
806 diesel, 1963 (Fair)	4500
806 diesel, 1965 (Rough)	3850
806 diesel, 1967 (Fair)	3800
806 diesel, 1967 (Fair)	5400*
806, 1966 (Fair)	4000
806, 1966 (Fair)	3300
808, 1965 (Fair)	3000
856 diesel, 1973 (Good)	6700
856 diesel, 1970 (Good)	8000*
856 diesel, 1969 (Fair)	5300*
856 diesel, 1968 (Fair)	6100
856,	7075
886 diesel, 1969 (Good)	7500
966, 1974 (Good)	7600
966, 1975 (Fair)	8550
986 diesel, 1979 (Good)	14,500*
1026, 1973 (Fair)	6925*
1066 diesel, 1975 (Good)	9800
1066, 1975 (Rough)	8300
1066 diesel, 1974 (Fair)	7900
1066 diesel, 1975 (Good)	11,200*
1066, duals, 1976 (Good)	12,375
1066 diesel, 1974 (Good)	9000
1066 diesel, duals, 1973 (Good)	12,200*
1066 diesel, 1975 (Good)	11,700*
1066 diesel, 1976 (Fair)	9300
1086 diesel, 1974 (Good)	16,000*
1086 diesel, 1978 (Good)	14,500*
1206, 1967 (Good)	5150
1256 diesel, 1969 (Good)	8200
1256 diesel, 1966 (Fair)	6500
1466 diesel, 1975 (Fair)	8100*
1466 diesel, 1973 (Good)	9450*
1466 diesel, 1974 (Good)	10,500
1466 diesel, 1975 (Good)	9750
1466 diesel, 1973 (Good)	8700
1486 diesel, 1979 (Excellent)	20,250*
1586 diesel, 1979 (Good)	16,500*
1586 diesel, 1978 (Good)	13,750*
3500, hoe, ldr.,	7200*
3788, (New)	32,000*
4586 diesel, 1978 (Good)	26,000
Sup. C, 1951 (Fair)	1000
330, 1958 (Fair)	1775

MINNEAPOLIS-MOLINE TRACTORS

Jet Star 3, 1960 (Rough)	900*
Jet Star 3, ldr., (Good)	3050
445, ldr., 1963 (Rough)	950
M-670, 1967 (Fair)	1800
M-670 diesel, 1966 (Good)	4550
M-670 diesel, 1967 (Good)	4000*
G-900, 1964 (Rough)	3100*
G-1350, (Rough)	6250*

COCKSHUTT TRACTOR

1650 diesel, 1965 (Rough)	2900

VERSATILE TRACTOR

700, 1974 (Excellent)	20,100*

STEIGER TRACTOR

Bobcat, 1974 (Good)	8000

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Circle (6) on Reply Card

Auctions *(continued)*

FORD TRACTORS

8N, 1950 (Good)	1500
8N, 1950 (Fair)	1150
8N, 1950 (Good)	1525
9N, ldr., 1945 (Fair)	850
9N,	750
9N, 1945 (Rough)	585
9N, 1944 (Rough)	825
600, 1954 (Good)	2000
800, 1955 (Fair)	2500
901 SOS, 1961 (Fair)	1375
901 SOS, 1956 (Fair)	1325
4000 diesel, 1971 (Fair)	3950*
4000, 1971 (Fair)	3800*
5000, 1965 (Fair)	5100*
5000,	4750
7000, 1976 (Good)	7300
7000 diesel, 1973 (Fair)	7300
8000, 1972 (Fair)	5300*
8000, duals, 1972 (Fair)	4850
8000 diesel, 1971 (Rough)	4600*
8600, 1974 (Fair)	8800*
9000, 1969 (Good)	7100
1600, 1980 (Excellent)	4050*
5600 diesel, 1978 (Good)	6700*
3400, hoe, ldr.,	3300*
3400, ldr.,	3550
4500, hoe, ldr.,	4000
9700, 1979 (Good)	17,100

OLIVER TRACTORS

77, 1950 (Good)	600
88, (Fair)	510
550, ldr., 1964 (Rough)	1550*
1355 diesel, 1972 (Fair)	6500
1600, 1963 (Fair)	2750
1600 diesel, 1961 (Fair)	3000*
1650, 1965 (Fair)	3050
1650 diesel,	2900
1650 diesel, 1962 (Rough)	3400*
1650 diesel, 1966 (Good)	4200
1755, 1973 (Good)	5600
1800, 1962 (Fair)	2500
1800, 1963 (Fair)	2875
1800 diesel, 1963 (Fair)	2150
1800, 1962 (Fair)	2400
1800 diesel, 1962 (Fair)	3100
1800, 1961 (Fair)	2600
1850, 1966 (Fair)	4100
1850 diesel, 1965 (Rough)	3400
1855 diesel, 1972 (Fair)	6150
1855 diesel, 1965 (Fair)	5150
1900 diesel, 1962 (Rough)	1925*
1950, 1966 (Fair)	4800
1950-T, cab, 1965 (Fair)	4900
2655 diesel, 1973 (Fair)	8900

WHITE TRACTORS

2-105 diesel, 1977 (Good)	9900
2-135, 1976 (Fair)	9100*
2-150 diesel, 1975 (Good)	9100*
4-180, duals, 1975 (Fair)	15,000
4-180, (Excellent)	20,000
2-30, 1979 (Fair)	3800*

CASE TRACTORS

600,	975
580, hoe, ldr.,	6100
830 diesel, 1957 (Fair)	2800
830 diesel, 1966 (Fair)	2550
830 diesel, 1965 (Rough)	1800
830 diesel, 1966 (Rough)	1100
830 diesel, 1967 (Fair)	2850
830 diesel, 1966 (Fair)	1450
970 diesel, 1973 (Fair)	5150
970 diesel, 1972 (Rough)	4700*
1030 diesel, 1967 (Fair)	3600*
1030, 1966 (Fair)	4000
1030 diesel, 1965 (Fair)	4000
1030 diesel, 1967 (Fair)	4600*
1170 diesel, 1971 (Fair)	6200
1270 diesel, 1973 (Good)	8800*
1370 diesel, 1971 (Good)	8400*
1370 diesel, 1976 (Fair)	9800
1370, duals, 1976 (Fair)	11,750*

DAVID BROWN TRACTOR

1200, ldr., 1964 (Fair)	2450

DEUTZ TRACTORS

D10006, 1977 (Fair)	6000
D13006, 1974 (Fair)	8000*

JOHN DEERE TRACTORS

A, 1950 (Rough)	475
A, 1950 (Good)	675
B, 1948 (Fair)	325
G, 1950 (Rough)	675
40, 1955 (Rough)	680
40, 1955 (Rough)	1050
50, 1955 (Fair)	1175
60, ldr.,	800
60, 1953 (Rough)	1100
60, 1954 (Rough)	925
60, 1955 (Rough)	570
70, 1956 (Rough)	675
70, 1957 (Fair)	1050
80, 1955 (Rough)	1200
520, 1950 (Rough)	1200
520, 1957 (Good)	1700*
530, 1959 (Good)	1700
620, 1957 (Rough)	1557
620, 1957 (Good)	1400*
620, 1957 (Fair)	1225
720 diesel, 1957 (Fair)	1410*
720, 1956 (Good)	1750
720 diesel, 1959 (Rough)	1200*
720, 1959 (Fair)	1450
720, 1957 (Fair)	1500
720 diesel, 1957 (Fair)	1600
720, 1959 (Fair)	1400
730 diesel, 1959 (Fair)	1800
730 diesel, 1959 (Fair)	1950*
920, 1971 (Rough)	3600*
1020, 1971 (Fair)	3600*
1020, 1971 (Rough)	3000*
2010 diesel, 1963 (Rough)	1700*
2010, 1963 (Rough)	1700*
2010, 1962 (Rough)	1800*
2030 diesel, ldr., 1973 (Good)	5100
2440, ldr., 1982 (New)	14,600*
2510, (Fair)	3350
2640, ldr.,	10,000
3010, ldr., 1962 (Rough)	4325
3010, 1963 (Rough)	2300*
3010, 1963 (Rough)	1800*
3010, 1962 (Fair)	3300
3020 diesel, 1967 (Good)	6175
3020 diesel, 1970 (Good)	6200*
3020 diesel, 1970 (Good)	6950
3020 diesel, 1968 (Fair)	6075
3020, 1967 (Fair)	6500
4010, 1961 (Good)	4800*
4010, 1963 (Good)	5200
4010 diesel, 1964 (Fair)	3500
4010, 1963 (Good)	4975
4010, 1963 (Fair)	3250
4020, 1966 (Fair)	6375
4020 diesel, 1968 (Good)	6800*
4020, 1965 (Good)	7150*
4020 diesel, 1963 (Fair)	6300
4020 diesel, 1966 (Good)	6500
4020 diesel, 1965 (Fair)	5500
4020 diesel, 1970 (Good)	7550*
4020 diesel, 1968 (Good)	6750
4020 diesel, 1965 (Good)	6450
4020 diesel, 1966 (Good)	6400*
4020 diesel, 1967 (Excellent)	7150
4020 diesel, 1966 (Good)	6100
4020, 1965 (Good)	4150
4020, 1965 (Fair)	4000*
4020, 1966 (Fair)	6150
4020 diesel, 1970 (Good)	7900*
4020 diesel, 1966 (Fair)	6500*
4020 diesel, 1970 (Fair)	7650
4020 diesel, 1965 (Fair)	5950
4020, 1965 (Fair)	4400
4020, 1966 (Good)	3800*

(Continued on page 24)

ATTENTION

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Auctions

(Continued from page 8)

4020 diesel, 1964 (Fair)	6850*
4020 diesel, 1965 (Fair)	5600*
4020 diesel, 1964 (Fair)	6850*
4020 diesel, 1967 (Fair)	5800
4020 diesel, 1967 (Good)	6900*
4030, 1973 (Good)	10,700*
4030 diesel, 1973 (Good)	9300
4230 diesel, 1976 (Good;	13,000
4230 diesel, 1976 (Fair)	12,300
4230 diesel, 1977 (Excellent)	15,800*
4230 diesel, 1975 (Fair)	14,000*
4230 diesel, 1974 (Good)	12,500*
4230 diesel, 1974 (Good)	10,900*
4230, 1975 (Rough)	10,000
4320 diesel, 1971 (Good)	9400*
4320 diesel, 1971 (Good)	9750
4320 diesel, 1970 (Good)	9300*
4320, 1971 (Good)	9600*
4320 diesel, 1969 (Good)	11,200*
4430 diesel, 1974 (Good)	13,000*
4430, 1976	15,250*
4430, 1973	13,300
4430, 1975	14,000
4430 diesel, 1976 (Fair)	14,000
4430 diesel, 1974 (Good)	14,500*
4430 diesel, 1976 (Good)	14,300
4430 diesel, 1975 (Good)	14,250
4430 diesel, 1975 (Good)	13,800*
4430 diesel, 1973 (Good)	12,600*
4430 diesel, 1976 (Good)	16,300
4440 diesel, 1980 (Excellent)	21,000*
4440 diesel, 1980 (Excellent)	30,250*
4440 diesel, 1980 (Excellent)	23,250*
4520 diesel, 1968 (Fair)	7250
4630 diesel, 1976 (Good)	15,000*
4630, 1977 (Good)	19,000
4630 diesel, 1976 (Good)	15,750*
4630 diesel, 1973 (Good)	12,600*
4640 diesel, (New)	36,000*
5020 diesel, 1969 (Fair)	6600
5020 diesel, 1970 (Good)	7700
6030 diesel, 1973 (Good)	16,000*
310, hoe, ldr.,	7350

ALLIS-CHALMERS TRACTORS

WC, 1941 (Rough)	375
WD-45, 1953 (Fair)	950
WD-45, 1950 (Rough)	475
WD-45, 1952 (Good)	700
WD-45, 1951 (Fair)	975
WD-45, 1951 (Rough)	1000
WD-45, 1951 (Rough)	800*
D-14, 1963 (Fair)	1175*
D-17, 1964 (Fair)	2000
D-17, 1965 (Rough)	1125
190-XT diesel, 1968 (Rough)	4600*
190-XT, 1967 (Fair)	3200
190-XT,	3800
200 diesel, 1973 (Good)	7300*
200 diesel, 1973 (Good)	8100
200, 1974 (Fair)	8800*
220 diesel, 1972 (Fair)	5700
5040 diesel, 1978 (Good)	3700*
5040, 1979 (Rough)	3900*
7030, 1974 (Good)	9800*
7030 diesel, 1974 (Fair)	7750
HD-7, ldr.,	2900

FERGUSON & MASSEY-FERGUSON TRACTORS

50, 1960 (Rough)	1325
85, 1960 (Good)	1800
165 diesel, 1969 (Fair)	3700
165, 1970 (Rough)	3200
165, 1969 (Fair)	4200
180, 1970 (Good)	3200
265 diesel, ldr., 1977 (Fair)	5720
275, 1979 (Good)	9400
1085, 1977 (Fair)	6500
1100 diesel, 1968 (Fair)	4200
1100 diesel, duals, 1967 (Fair)	4300
1130,	4000
1150, 1974 (Fair)	6250*
20, ldr., 1979 (Excellent)	9000*
202, ldr.,	2125

NOTES:
Prices reported are for individual sales at wholesale on "as is," "cash and carry" basis.
Prices reported are NOT averages.

Condition classifications: EXCELLENT means—Engine: in perfect condition, 400 to 600 hours of use: Rubber: 80% tread remaining, no breaks or cracks; Paint: original and bright; General Appearance: excellent.

GOOD means—Engine: good running condition; Rubber: 70% tread remaining, no breaks or cracks; Paint: original paint or a good repaint job; General Appearance: good over-all.

FAIR means—Engine: possibly in need of a minor overhaul to restore; Rubber: 60% tread remaining, some cracking evident in side walls; Paint: only fair, weathered and some rust apparent; General Appearance: worn, some dents, minor parts such as gage covers missing or broken.

ROUGH means—Engine: obviously in need of a major overhaul; Rubber: smooth; Paint: scarred, weathered, rusty, needs painting urgently; General Appearance: dents, ruptures, broken parts, loose wires, some components such as lights broken, missing or inoperative.

DEMONSTRATOR means—used for demonstrating only and in practically new condition.

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How do major inventories look today?

Not so many years ago, when interest rates were much lower, industry marketers set what they considered 'acceptable' inventory levels. How would the industry stack up today by those standards?

By Bill Fogarty

■AS ONE reviews farm equipment inventory history over recent years, several fantasies come to mind:

In one, the industry takes the form of an ex-beauty queen who sees each day this buildup of fat on the tummy, thighs and elsewhere. Knowing that this will destroy her popularity, she indulges in violent exercise and popping amphetamines (call it intense discounting) to get rid of that inventory of cellulose (or tractors and combines). But every time she loses a few pounds, she celebrates with a pizza binge, and the next trip to the scales provides a reading even more dreary than the one before.

In another, a young child asks his father, a marketing executive, where inventories come from. Flustered, the man removes his nose from the *Wall Street Journal* long enough to sputter: "Uh, the doctor brings them in a little black bag. Er, the inventory fairy puts them under my pillow. Umm, they're found under leaves in the cabbage patch. What put strange questions like that into your head, anyway?" And after he shoos the kid away, he sits and ponders, "Where *do* they come from, anyway?"

Or this one: It's a movie in which we have not only the prehistoric monster Godzilla (played by Low Commodity Prices), we also have King Kong (played by Interest Rates) sharing star billing. In this flick, they don't fight each other. Instead, they *mate* and their offspring is called Industry Inventory. Together, the fearsome trio sets off to destroy the world. And there are all those grim-faced B actors cast as officers and enlisted men in the farm equipment army. The firing of salvo after salvo of heavy merchandising barely makes a dent in the inventory monster. Brave infantrymen (salesmen) are sent out on reckless bayonet charges, but they seem only able to snip off little bits of the beast's tail, which somehow keeps growing and growing....

Where's inventory now?

I&T dug out FIEI monthly reports of retail sales of farm tractors and self-propelled combines, which also include monthly inventory tallies both for what's at the factory and what's in the field. (The latter, of course, is dealer inventory which is not paid for.)

We took quarterly numbers on tractors and combines starting back on Dec. 31, 1976, and running up to the end of 1981. That's what you see in the *Industry Inventories* table. As is apparent, if you compare respective quarters, the count has had a way of inching upward through most of our recent history.

For instance, self-propelled combines had always managed to finish each year with a count of under 10,000 units on hand. But the last two years have seen the count running over 12,000.

One mitigating factor: The low levels recorded at the top of the table are somewhat deceptive. Deere & Co. had experienced a strike that ran approximately a month in the fall of 1976. The action had an unusual effect on the retail market; many people, not knowing how long production might be disrupted, advanced their plans for buying a tractor or combine. And since Deere has such an important share of the market, it made a real difference. We are not likely to see such low inventory levels again for a long time.

What's acceptable?

Over six years ago (November, 1975) an FIEI survey asked industry executives to indicate what they considered to be an "acceptable" level of inventory as a per cent of sales. They indicated thus: Two-wheel-drive

Inventory as a Per Cent of Sales

[illegible]	Tractors [illegible]			[illegible]		
[illegible]	[illegible]	Sales	[illegible]	[illegible]	Sales	[illegible]
1977	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	63
[illegible]	[illegible]	[illegible]	77	[illegible]	[illegible]	62

[illegible]

[redacted]

[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Dec., 1976	31,554	19,335	4,998	55,887	4,524
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Dec., 1977	40,405	30,912	5,538	76,855	9,665
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Dec., 1978	32,501	26,504	4,723	63,728	9,161
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Dec., 1979	37,881	27,197	6,098	71,176	8,339
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Dec., 1980	38,115	25,125	7,470	70,710	12,070
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Dec., 1981	38,445	34,850	6,695	79,986	12,704

[redacted]

farm tractors, 35 per cent; four-wheel-drive farm tractors, 25 per cent; self-propelled combines, 35 per cent.

However, at the time, the actual inventory levels were at unacceptable levels: too high for tractors under 80 hp at 45 per cent; too low for over-80 models at 26 per cent; too high for four-wheelers at 38 per cent; too low for self-propelled combines at 13 per cent.

It's important to remember, however, that we're looking at averages. Some of the companies may have been on target. In any case, most of the reporting companies indicated that by sometime in 1976, they ex-

(Continued on page 22)

Inventories

(Continued from page 11)

pected to have their inventories in acceptable conditions.

In retrospect, the lack of concern appears reasonable if one takes a look at interest rates in those days. According to the Federal Reserve Bulletin, the average prime rate for three-month commercial paper as of July 1, 1976, was 5.24 per cent; for six-month paper, it was 5.65 per cent.

First	Rate (pct.) for prime commercial paper	
of July,	**3-month**	**6-month**
1977	5.54	5.60
1978	7.94	7.99
1979	10.97	10.91
1980	12.66	12.29
1981	16.35	15.46

But times have changed. Interest rates taken from the same Federal Reserve table have shown the following progression:

The final set of figures to consider is tractor and combine inventories as a per cent of sales, as shown in the smaller table. It indicates that even in a couple of fairly good sales years, with interest rates only beginning their unprecedented climb, the inventory levels were not very close to "acceptable" even as defined when interest rates were lower.

So what would be an acceptable level for 1982? Industry executives have not been polled publicly on the subject for some years, but it would seem that if interest rates have about tripled, the acceptable level would have to fall at about half that of 1975-76.

A number of industry people have been saying it for years, but it bears saying again: As long as interest rates remain high, the time span from the completion of manufacture until the date of retail sale will have to be shortened. If not, the farm equipment industry will probably be a generally low-profit area of enterprise, with only occasional spurts into realms of profitability on a par with other industries. □

INDUSTRY IN MOTION

Richard Ruh has joined **Yanmar Tractor (U.S.A.), Inc.,** Bensenville, Ill., as manager of distribution. He was formerly with Arps, Div. of Chromalloy.

Edward C. Tucker has been appointed director of manufacturing for **Trail King Industries,** Mitchell, S.D. He was previously with Long Mfg.

U.S. firms are invited to exhibit their products at the **1982 Algiers International Fair,** Aug. 25-Sept. 10. The fair will feature agriculture and water resources equipment, aviation products, telecommunications equipment, light industry products, construction equipment, mining machinery, and oil and gas equipment. Interested firms should contact James Mied, Room 2106, U.S. Dept. of Commerce, Washington, DC 20230, phone 202-377-3786.

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WHAT HAPPENED TO

■IF YOU WERE thinking about comparing numbers on this 1981 table with the same data for 1980 (I&T, April 21, 1981), perhaps we can save you the trouble.

In terms of horsepower brackets, sales volume was down in all but two categories—two-wheelers, 140-149 hp, and four-wheelers, over 250 hp. In three other brackets, the decline was slight enough to be about even—two wheelers, 70-79 hp and 80-89 hp, and four-wheelers under 200 hp. Total tractor sales declined from 119,331 units in 1980 to 103,835 last year.

A few states showed tractor sales improvements. The volume in Texas, almost always the largest unit volume state, went up by approximately 9 per cent, from 10,047 to 10,989 tractors. We asked R. B. Allen, executive vice-president of the Southwest Hardware & Implement Assn., what caused the improvement.

"You have to look at 1980," he replied. "That was a very bad drought year; we had over 100 days in which the temperature went over 100 degrees."

Another state with an improvement was North Dakota—sales rose 7 per cent from 2,575 units to 2,772. Keith Howard, executive vice-president of the North Dakota Implement Dealers Assn., observed that most of the sales strength took place in the first quarter of 1981, coming off of a weak 1980.

Horsepower volume

Implement & Tractor made a rough comparative tally of horsepower units sold in 1980 and 1981.

In 1980, the U.S. industry sold 10.8 million units of horsepower. The heaviest concentration ran from 80 to 139 horsepower—4.97 million units.

Last year, the industry sold 9.4 million units. Again, the concentration was from 80 to 139 horsepower, with 4.46 million units sold. ☐

	Two-Wheel-Drive Tractors						
State	40-49	50-59	60-69	70-79	80-99	100-119	120-129
Alabama	465	240	171	200	177	146	24
Alaska	19	21	4	1	5	3	.....
Arizona	40	35	61	61	151	155	12
Arkansas	551	289	264	99	137	94	23
California	419	627	812	856	628	273	46
Colorado	70	90	88	24	94	92	36
Connecticut	36	46	41	7	20	12	.....
Delaware	14	15	13	12	11	9	6
Florida	497	260	362	371	334	224	21
Georgia	628	264	271	181	253	147	50
Hawaii	21	9	6	11	8	1	.....
Idaho	50	92	119	47	205	186	103
Illinois	189	194	328	273	371	420	171
Indiana	149	170	235	140	251	224	84
Iowa	73	133	288	231	625	768	239
Kansas	91	79	153	84	247	388	175
Kentucky	806	645	554	280	362	154	30
Louisiana	608	226	258	151	134	156	26
Maine	69	33	47	9	32	31	9
Maryland	109	84	75	38	91	62	11
Massachusetts	36	51	21	21	13	9	.....
Michigan	213	277	338	198	337	268	94
Minnesota	81	182	363	213	688	616	212
Mississippi	419	226	219	129	166	160	39
Missouri	327	323	474	205	435	320	101
Montana	125	107	116	30	154	123	55
Nebraska	46	38	90	39	267	413	110
Nevada	7	16	12	3	13	6	.....
New Hampshire	30	35	24	12	27	5	1
New Jersey	65	33	22	23	43	16	3
New Mexico	55	28	38	34	26	20	9
New York	209	245	374	203	628	259	41
North Carolina	785	367	346	209	435	183	53
North Dakota	16	39	49	30	92	282	168
Ohio	309	328	384	193	384	285	89
Oklahoma	351	182	176	113	258	371	72
Oregon	250	176	173	79	153	80	13
Pennsylvania	291	283	371	159	357	193	40
Rhode Island	6	2	2	1	1	2	.....
South Carolina	270	151	131	96	127	52	19
South Dakota	14	35	65	41	208	301	90
Tennessee	746	420	336	164	242	174	34
Texas	2,000	1,004	1,019	712	928	968	180
Utah	80	91	85	49	88	70	29
Vermont	53	49	79	15	84	22	4
Virginia	462	300	250	111	240	97	25
Washington	405	333	185	90	117	46	15
West Virginia	125	77	65	20	41	7	2
Wisconsin	107	285	683	338	900	644	182
Wyoming	17	32	36	13	68	40	14
U.S. Government	.....	.....	7	2	.....	6	.....
Miscellaneous	58	1	22	150	11	5	.....
TOTAL	**12,862**	**9,268**	**10,705**	**6,471**	**11,667**	**9,588**	**2,760**

Turn page for: FARM TRACTORS, Makes & Models on the 1982 North American Market

2 WHEEL DRIVE TRACTORS (PTO HP)

Hines model H1500, 16 hp
Tri-Tractor's Tuff-Built, 15 hp

PTO HP	Allis-Chalmers	Belarus	Bolens / CBT	J I Case	John Deere	Deutz	[illegible]	Ford	Hesston-Fiat	International Harvester	Kubota	Lamborghini	Landini	Long	Massey-Ferguson	Mitsubishi	Same	Steyr	Universal	White	Yanmar	Zetor
200																						
180	7080			2590	4840					5488					MF2805					2-180		
160	7060			2390				TW30	1880	5288					MF2775							
140	7045				4640	DX160						1556			MF2745		Hercules			2-155		
120	7020			2290	4440	DX140 DX130		TW20	1580 1380	5088		1356			MF2705			8140		2-135		
100	7010			2090	4240	DX120 DX110		TW10	1180	3688		R1256 R1156		1310	MF2675		Buffalo Drago Tiger Six	8120		2-105		12011
90			CBT 2105, 2600	1690	4040				980	3288		R1056					Panther, Jaguar	8100				
80	6080		CBT 2500		2940	DX90		7610, 7710	880			R955			MF285		Leopard Mercury			2-85		8011
70		800, 820		1490	2640		480	6610, 6710	780	884 [redacted]	M7500	R854 R784	282, 482	910			Centurion	8080		2-75 2-70		
60	6060	500, 520		1390	2440	D6806, D6807 D6206, D6207	470	5610	640, 680	784 684		R754 R654	272, 472	610	MF275 MF265		Centauro	8070		2-62		6011
50	5050	400, 420	CBT 2080 CBT 2070	1290	2240	D5207	460	4610	580	Hydro 84 584	M5500 M4500	R653 R603	262, 462		MF255		Minitaurus Taurus Condor		530			
40	5045			1190	1250 2040	D4506, D4507	360	4110 3610	480	484		R503	245	510 460	MF245			8060	445	2-45		5011
30					1050			2610		384		R235	235	360	MF230	S750	Delfino		350 340	2-35		
20	5030 5020	250	G242, G244		950 850			1900 1700		274, 284	L345 L295, L305 L275 L245			310 280	MF220 MF210	S670 S650 S630			300	2-30	YM330 YM276	
10			G192, G194 HT23 G172, G174 G152, G154		750 650			1500 1200, 1300 1100			L235 B8200 B7100 B6100 B5100				MF205	S470 S373 S370, S372					YM226 YM186 YM165	

The business magazine of the farm & industrial equipment industry

May 7, 1982
TWO DOLLARS

Implement & Tractor

A20800----SHWLA5201 XXXXX 11N
0 15 0 000030
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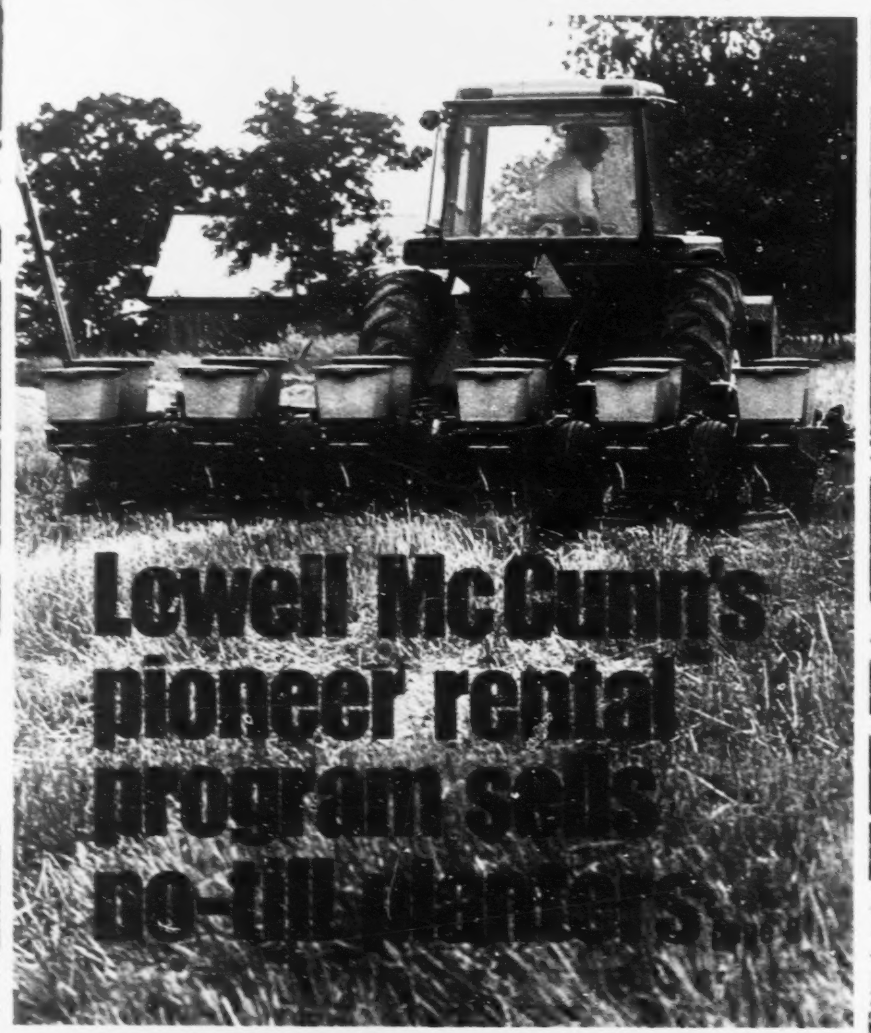
CONGRESSIONAL INFO SERV
4520 EAST WEST HWY
BETHESDA MD 20814

-1 C4725-1 5/24/82



Lowell McCunn's pioneer rental program sells no-till planters...

In the **Manufacturers Edition**
First International Agri-Component Exposition

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ISSN 0019-2953/81 $2.00 + 0.00

INTERTEC PUBLISHING CORP.

Implement & Tractor

The business magazine of the farm & industrial equipment industry

May 7, 1982 • Vol. 97 • No. 11

page 24

page 28

Reduced Tillage and Equipment Sales

I&T leads off this issue with two articles that may help dealers feel better about a concept in which machinery does **less** work for the farmer. One tells what a dealer is doing today. The other is by a veteran who recalls similar major changes.

8: **McCunn's Pioneer Effort: Renting No-Till Planters.** In hilly western Iowa, where soil conservation is a matter of some urgency, this Deere dealer got help from SCS and extension people.

14: **Reduced Tillage – Not a Sales Wrecker!** Walt Buescher, our Year of the Salesman commentator, recalls his first brush with minimum tillage – and his early attempts to cope with change by ignoring it.

24: **When the Service Manager Turns to Selling...**Steve Bockting (left in picture above) started back in the shop. When his brother Bill (right) turned him loose as equipment salesman, his skills with technical matters and with people paid off handsomely. Another Year of the Salesman feature.

28: **Selling Irrigation/Selling Tractors – a Good Balance.** Down in south Georgia, Bob Kennon covers a nine-county area with his Lockwood line, a good counterpoint to his Ford tractor business.

43: **New 4-Wheelers from Allis-Chalmers.**

On the cover...A rare skip in this Iowa field shows the good weed control of corn planted in wheat stubble.

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What's Ahead...

I&T
SINCE 1886

May 7, 1982

U.S. RETAIL SALES OF FARM TRACTORS in the first quarter were off 5 per cent, but sales of two-wheel-drive models over 100 hp are up 5 per cent for the period and up 2.8 per cent for March. Three-month sales of combines, conventional balers, forage harvesters and mower conditioners were down substantially. Here's the FIEI flash report:

	Unit Retail Sales					
	March			January-March		
	1982	1981	Pct. Change	1982	1981	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
40-100 hp	4,154	4,429	- 6.2	10,067	11,276	-10.7
Over 100 hp	3,596	3,497	+ 2.8	9,592	9,133	+ 5.0
Total 2-wheel drive	7,750	7,926	- 2.2	19,659	20,409	- 3.7
4-wheel drive	696	881	-21.0	1,926	2,319	-16.9
Total Tractors	8,446	8,807	- 4.1	21,585	22,728	- 5.0
Combines (S-P)	487	1,128	-56.8	2,371	3,819	-37.9
Balers*	334	610	-45.2	932	1,468	-36.5
Forage Harvesters**	165	278	-40.6	613	722	-15.1
Mower Conditioners	557	918	-39.3	1,564	2,082	-24.9

*Bales under 200 lbs. **Shear-bar type.

SURVEY OF DEALERS INDICATES EXPECTATIONS OF A 1982 UPTURN, reports John Dougherty, national sales manager for Chromalloy Farm Equipment Div. The survey finds 15 per cent of responding dealers think there will be a second-quarter upturn; another 31 per cent said business will improve in the third quarter and 23 per cent indicated the fourth quarter. "Over half the dealers felt market recovery would be moderate," says Dougherty. "About 44 per cent said recovery would be slow....Several dealers said retail sales will improve only if commodity prices get close to production cost levels; others said prices will have to reach at least 80 per cent of parity....Some dealers feel interest rates will need to fall to at least 12 per cent before farmers can begin buying equipment. Others noted that while interest rates are a consideration,...the future revolves around commodity prices and the need for farmers to receive a fair return on their investments." Chromalloy markets shortline farm equipment under the Arps, Burch, Kewanee and Schwartz brand names.

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Editor's Notebook

(continued)

unprecedented rewards for skilled cash managers.

In this business, *kanban* has traditionally been something the North American farmer could count on. He could wait until he knew he had a crop made, for example, before going to see his dealer about a combine. He'd get it *kanban*—just in time. Inventory holding costs (*i.e.,* floor planning expense) were built into the machine's price, but it was a good deal as long as interest rates were low.

Today, however, interest rates are terrible. And the cost of floor planning still must be borne eventually by the final customer, the farmer. If he clearly understood what his *kanban* system costs him, maybe he'd want something different.

Speaking of matters Japanese, the Industrial & Construction Equipment Div. of FIEI is preparing a June 7-8 outlook conference whose theme is "Strategic Issues—the Japanese Challenge." Speakers will get into the matter from the standpoints of manufacturing, human resources, marketing and political response. The meeting is to be held at the Indian Lakes Convention Center, Bloomingdale, Ill. For more information, call Lynn Huffman at FIEI, 312/321-1470.

Who are ag advertising's big spenders? Not many from this industry in '81

Agricom is the organization in St. Joseph, Mo., that keeps a tally on how much money is spent on agribusiness print advertising in the U.S. Every six months, they issue a listing of what they count as the top 150 advertisers.

What follows is I&T's extraction of farm equipment companies in the Top 150 for 1981. We show the ranking, company name, amount spent in 1981 and show the increase (or decrease) in outlay from 1980.

(Note: The Agricom totals leave out money spent on TV and radio.)

Rank	Company	1981 Outlay	Pct. Change
4.	Deere	$4,822,616	9.75
6.	Int. Harv.	4,082,481	5.88
9.	Ford Motor	2,920,706	13.23
11.	New Holland	2,371,451	6.40
16.	Massey-Ferg.	1,622,557	26.47
21.	Allis-Chalmers	1,441,954	17.67
30.	J I Case	1,165,538	(16.09)
44.	White Farm	745,795	(27.70)
46.	Hesston	728,558	(8.27)
58.	New Idea	548,702	(20.95)
59.	Valmont	544,312	62.85
62.	Gehl	535,637	4.48
67.	Kubota	488,735	3.02
73.	Kewanee	415,149	39.05
79.	Bush Hog	361,090	(8.37)
80.	Lindsay	355,989	(1.97)
85.	Caterpillar	352,452	(3.47)
89.	Deutz	328,579	27.16
96.	Brillion	279,096	5.92
104.	Steiger	260,152	49.08
109.	Lockwood	251,800	141.81
113.	Farmhand	236,236	(12.69)
115.	Vermeer	231,998	(6.62)
132.	Dickey-john	193,936	26.19
135.	Patz	192,145	11.93
138.	Chore Time	185,378	69.00
142.	Detroit Diesel	183,842	66.68
145.	Badger N'land	182,723	(2.65)
146.	Tye Co.	182,542	121.32
147.	M&W Gear	180,924	33.96

Now, if you will permit some comments about this listing:

- Without running a check on the Top 150 lists of earlier years, I'll bet there were more farm equipment companies represented in past years than 1981. In the face of weakening markets, farm chemical, fertilizer and seed companies have kept up their heavy merchandising efforts more strongly than have farm equipment companies.
- Ford's advertising includes both farm tractors and road vehicles, including trucks.
- Kewanee had a major surge in advertising volume, but in 1981, several Chromalloy companies were merged into Kewanee.
- There are 30 farm equipment companies listed among the Top 150, but if we include tires as farm equipment, there are 33—Goodyear, 52nd with $630,531, up 18 per cent; Firestone, 101st, $264,171, down 65 per cent; Goodrich is 130th at $198,360, up 98 per cent.

What if... Reflecting on these numbers, I wonder what the tallies would have been if every farm equipment dealer in the land had fully taken advantage of every cooperative advertising program that had been made available by manufacturers.

If that had happened, there would have been many additional farm equipment faces on Agricom's list, though some of them would have been brought there kicking and screaming.

In that context, I sometimes have this vision: Here's this farm equipment marketing executive chewing out the ad manager because the new, simplified co-op ad program is getting unprecedented use by dealers, threatening to pop the division's ad budget. That task done, the executive returns to the latest market study and wonders why the company is increasing market share. That night, he looks in the mirror and improvises an acceptance speech at a NAMA Agri-Marketer of the Year...just in case.

IMPLEMENT & TRACTOR

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May 21, 1982
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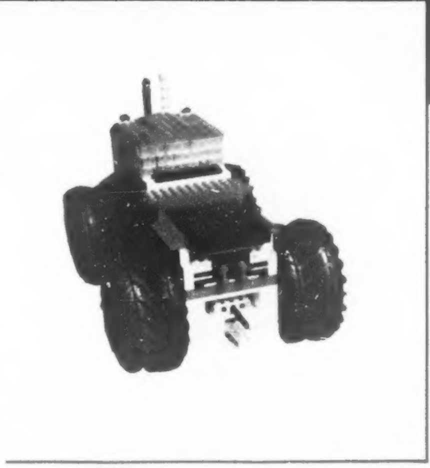
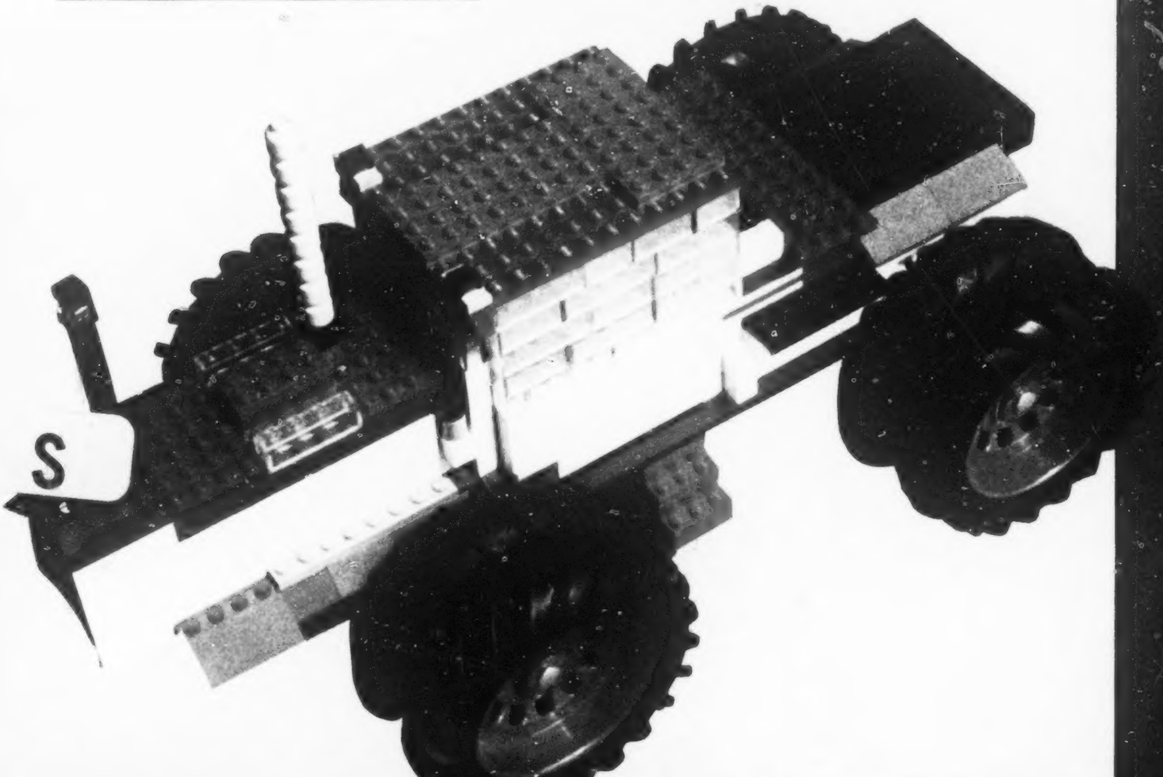


Marketing a 300-hp four-wheeler:

WHICH FEATURE PACKAGE WILL SELL BEST? page 18



Dealers getting liquid page 20

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INTERTEC PUBLISHING CORP.

Implement & Tractor
The business magazine of the farm & industrial equipment industry
May 21, 1982 • Vol. 97 • No. 12

MID-70s SELLING WAS A BREEZE, AND THEN...

"Year of the Salesman" series focuses on two young dealers who got into the business when things were hot. Was it tough to adjust?

8: **Walterman: "You're the one that farmer wants to trust..."** This Dike, Ia., retailer found that when the crunch came, he was prepared by a lifetime of backgrounding.

10: **Dietz: "I had to adjust, learn selling skills..."** At Seguin, Tex., this dealer had to build new sales strengths, but he had already shown himself to be a servicing dealer.

14: **Quality Circles, Goals/Feedback, Knowing the Type-A.** Spring Management Clinic of the Farm Equipment Manufacturers Assn. at San Antonio, Tex.

18: **Which Features Would Sell Best?** The optimum package could be determined by advance research. What if it was a 300-hp four-wheel-drive tractor?

20: **Dealers Getting Liquid.** The auction pace has been unusually busy as dealers have been paring inventories.

24: **New Ideas at France's SIMA.** And 25 wholesalers from North America came shopping for new products.

On the cover: The tractor was constructed, with wheels from two Ertl toy IH models and Lego building materials, by Rob Fogarty.

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AUCTION PRICES OF USED EQUIPMENT

An exclusive I&T monthly report of actual prices paid recently at these leading national wholesale auctions.

Asterisk beside tractor price indicates highest bid offered on tractors which were not sold.

YODER & FREY INC.
Archbold, Ohio
April 12 & 13, 1982

INTERNATIONAL HARVESTER TRACTORS

A, 1947 (Rough)	630
A, 1952 (Fair)	1625
Cub, cult., 1954	950
Cub Lo-Boy G, (Fair)	1200
Cub Lo-Boy, 1960 (Fair)	2250
154 Lo-Boy, (Fair)	2200
H, (Fair)	370
H, 1950 (Fair)	675*
H, 1951 (Rough)	475
H, 1950 (Fair)	600*
H, 1950 (Fair)	750
H, 1947 (Rough)	535
H, 1949 (Fair)	550
H, (Rough)	270
H, 1950 (Fair)	660
SH, 1952 (Rough)	525
M, (Good)	460
M, (Fair)	460
M, 1947 (Fair)	800
Sup. M, (Good)	725*
Sup. M, 1954 (Good)	875*
Sup. M, 1957 (Fair)	975
Sup. M, 1953 (Fair)	850*
Sup. M, 1950 (Rough)	1150
Sup. M, 1953 (Rough)	725
Sup. M, 1953 (Good)	950
Sup. M, 1953 (Fair)	1035
240, 1958 (Rough)	1250
450, 1958 (Rough)	1075
450, 1958 (Rough)	500
450,	510
460, 1960 (Fair)	1100*
460 diesel, 1961 (Good)	1950
460, 1959 (Rough)	1400*
460, 1961 (Fair)	1025
460 diesel, 1961 (Fair)	1650*
460,	2000*
560, (Good)	1500*
560, 1956 (Good)	1850*
560, 1959 (Fair)	1600*
574 diesel, ldr.,	7300
574 diesel, ldr.,	7300
574, 1973 (Fair)	4150*
656, 1967 (Good)	2500
656, 1969 (Good)	3200*
656, 1967 (Fair)	3100
656 hydro, ldr., 1967 (Fair)	4450*
656, 1970 (Fair)	3400
656, 1968 (Fair)	2500*
666 diesel, 1975 (Fair)	4750*
674, (Good)	5300*
686, 1977 (Good)	6000*
706, 1967 (Good)	2400*
706 LP, 1965 (Rough)	1450
706, 1964 (Fair)	2600*
706 diesel, 1965 (Fair)	4000*
706, 1964 (Rough)	2050*
756, 1969 (Good)	3800*
766, 1975 (Fair)	5000
806 diesel,	4500
806 diesel, 1965 (Fair)	3100
806, 1966 (Fair)	3450
806, 1966 (Fair)	4800*
806 diesel, 1965 (Fair)	4400
806 diesel, 1962 (Good)	3800*
806 diesel, 1966 (Good)	4300*
806 diesel	4500
806, 1965 (Rough)	2500*
806 LP, 1965 (Rough)	2750*
806 diesel, 1965 (Fair)	3950*
856 diesel, 1959 (Fair)	4900
856, 1970 (Good)	4925*
856, 1970 (Fair)	5000
856 diesel, 1970 (Rough)	4400
856 diesel, 1968 (Good)	6800*
986 diesel, 1978 (Excellent)	13,250*
986 diesel, 1978 (Good)	11,200*
986 diesel, 1978 (Fair)	9000*
1026 diesel, 1970 (Fair)	6300
1066 diesel, 1976 (Good)	8950
1066 diesel, 1976 (Good)	10,250*
1066, 1970 (Good)	4925*
1066 diesel, 1975 (Fair)	7900
1066, 1976 (Good)	9000*
1066 diesel, 1975 (Fair)	7330
1066, 1975 (Fair)	7500*
1066 diesel, 1974 (Fair)	7200*
1066 diesel, 1973 (Fair)	8000*
1086 diesel, cab,	11,850
1086 diesel, 1979 (Excellent)	16,000*
1086 diesel, 1978 (Good)	12,800
1206 diesel, 1965 (Fair)	5100
1206, 1966 (Fair)	5100
1256 diesel, 1969 (Fair)	6300*
1466 diesel, 1975 (Fair)	8400*
1466 diesel, 1974 (Good)	10,250*
1466 diesel, 1975 (Good)	8400*
1486 diesel, 1979 (Excellent)	18,000*
1486 diesel, 1978 (Excellent)	16,250*
1486 diesel, 1978 (Fair)	9200*
1566 diesel, 1975 (Good)	11,000*
1568 diesel, 1976 (Fair)	8500
1568 diesel, 1975 (Rough)	9250*
1586 diesel, 1979 (Excellent)	15,500*
1586 diesel, 1979 (Excellent)	15,200*
3788, (New)	27,750*
3500, hoe, ldr.,	7750

DEUTZ TRACTOR

D10006, 1974 (Rough)	5000*

MINNEAPOLIS-MOLINE TRACTORS

Jet Star 3 ldr., 1968 (Good)	2300*

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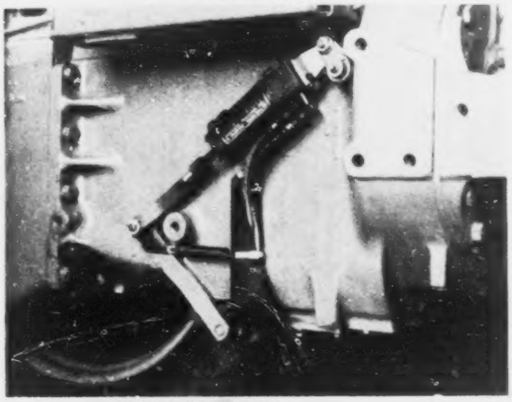

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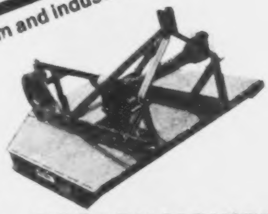

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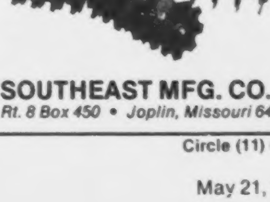

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Auctions *(continued)*

Jet Star 5,	800
U-302, 1959 (Rough)	1250*
U-302, 1949 (Rough)	1250
445, ldr.,	650*
445,	625*
M-602,	1400
M-670 diesel, 1968 (Rough)	3500*
G-1000 diesel,	2200
G-1050,	5200*

OLIVER TRACTORS

77, 1950 (Rough)	400*
77, ldr., 1949 (Rough)	700
77.	280
88, 1952 (Rough)	785
550, ldr., 1968 (Rough)	1750*
1250	800
1465 diesel,	3750*
1750 diesel, 1965 (Fair)	2600
1750 diesel, 1966 (Good)	4000
1750 diesel,	3800
1800 diesel, 1963 (Fair)	3000*
1800 duals, 1963 (Fair)	2350
1900 diesel,	1500*
2255 diesel,	6100
S-55,	1575
S-55,	1600

WHITE TRACTORS

2-70, (New)	10,500*
2-105 diesel, 1976 (Fair)	8600
4-150, 1974 (Fair)	11,000
4-150, 1975 (Good)	15,500*

CASE TRACTORS

630, 1965 (Fair)	1800
830 diesel, 1967 (Fair)	2500
830 diesel, 1965 (Fair)	2000
900 diesel, cab, 1956 (Fair)	1600
930 LP, 1964 (Rough)	2400*
930 diesel, 1966 (Good)	3650*
930, 1966 (Good)	2900*
930 diesel, 1975 (Good)	5250*
970 diesel, 1971 (Fair)	4500*
970 diesel, 1970 (Rough)	3750*
1030 diesel, 1968 (Good)	4250
1030 diesel, 1967 (Fair)	3800
1030 diesel, 1966 (Fair)	2500*
1030 diesel, duals, 1966 (Fair)	4000*
1030 diesel, 1966	3200*
1070 diesel, 1971 (Good)	7750*
1175 diesel,	6350
1270 diesel, 1971 (Good)	9000*
1290 diesel, 1980 (Good)	8000*
1370 diesel, 1971 (Fair)	8500
1370, 1972 (Fair)	6900*
1390 diesel, 1980 (Good)	9500*
1570, 1978 (Fair)	14,500*
2670, 1976 (Fair)	12,750*

COCKSHUTT TRACTORS

30, 1952 (Rough)	275
540, 1958 (Fair)	1225*
560, 1958 (Rough)	750
1750 diesel, 1966 (Good)	3650

FORD TRACTORS

8N, 1949 (Fair)	950*
8N, 1950 (Rough)	1200
8N, 1952 (Rough)	1050*
8N,	1060
8N,	1175
9N, plow, 1946 (Fair)	1500
9N, 1950 (Fair)	1000
Jub., 1954 (Good)	1750*
Jub., ldr.,	1950
Jub., 1953 (Fair)	1285*
Jub., 1953 (Fair)	1900
600, mo., 1956 (Fair)	1875
861, ldr.,	1575
2000, ldr., 1958 (Good)	2500*
2000, 1974 (Fair)	4300
3400, (Good)	1975
4000, ldr., 1955 (Rough)	2800*
5000 diesel, 1971 (Fair)	3800
5000, 1968 (Fair)	3350
5000, 1972 (Fair)	4700*
5000, 1975 (Good)	4300*
8000 diesel, turbo,	6000
8000 diesel, 1969 (Good)	5000*
8000 diesel, 1972 (Rough)	4700*
8600 diesel, 1972 (Rough)	6600*
8600, 1975 (Fair)	8000*
8600, 1970 (Fair)	6200*
9600, 1975 (Fair)	9600*
9700, 1980 (Good)	13,900*
5600, 1978 (Excellent)	6900

STEIGER TRACTOR

Bearcat 1976 (Good)	17,500*

JOHN DEERE TRACTORS

A, 1968 (Fair)	400
B.	370
B, 1947 (Good)	450
B,	370
B, 1940 (Fair)	350*
B, 1948 (Fair)	575
M, cult., 1950 (Fair)	800
40, 1955 (Rough)	1000
50, 1955 (Rough)	825
50, 1955 (Fair)	1050
50, 1956 (Rough)	925*
60, 1954	550*
420, 1957 (Rough)	1710
620, 1956 (Good)	1400
620,	1025
620, 1959 (Fair)	1150*
730 diesel, 1958 (Fair)	1600*
730 diesel, 1960 (Fair)	1500
830 diesel, 1957 (Fair)	1800*
1020 diesel,	2950
2010 diesel, 1962 (Rough)	1300*
2010, 1961 (Rough)	1150*
2010, ldr., 1962 (Fair)	3300
2030 diesel, 1976 (Fair)	5200*
2510, (Good)	3000*
3010, 1968 (Good)	1675
3010, 1962 (Rough)	2750*
3020 diesel, 1970 (Fair)	4500*
3020 diesel, 1969 (Fair)	4200*
3020, 1965 (Fair)	3100*
3020, 1967 (Fair)	3200*
4010, 1963 (Fair)	3000*
4010 diesel, 1960 (Fair)	4600*
4010 diesel, 1961 (Good)	4300*
4010 diesel, 1964 (Fair)	4700*
4020 diesel, 1970 (Good)	7850
4020 diesel, 1965 (Fair)	5750
4020, 1966 (Good)	3500
4020 diesel, 1965 (Fair)	6250*
4020 diesel, 1967 (Good)	5600
4020 diesel, 1968 (Good)	6600*
4020 diesel, 1965 (Fair)	4800*
4020 diesel,	5100
4230 diesel, 1974 (Fair)	9100*
4230, 1977 (Good)	14,500*
4230 diesel, 1974 (Good)	11,750
4230, 1974 (Good)	11,750*
4230, 1974 (Good)	11,100*
4320 diesel, 1972 (Good)	9750*
4320 diesel, 1971 (Good)	8750*
4320 diesel, 1971 (Fair)	7700*
4320 diesel, 1969 (Fair)	7100
4320 diesel, 1972 (Fair)	7850*
4430 diesel, 1976 (Good)	13,750*
4430 diesel, 1975 (Good)	13,750*
4430 diesel, 1974 (Good)	13,500*
4430 diesel, 1975 (Fair)	12,000*
4430 diesel, 1976 (Good)	13,000*
4430 diesel, 1976 (Good)	14,750*
4430 diesel, 1977 (Good)	12,750*
4440 diesel, (New)	28,000*
4440, 1979 (Fair)	21,110
4520 diesel, 1970 (Good)	7500*
4520 diesel, 1970 (Fair)	6900
4620 diesel, 1970 (Good)	9600*
4630 diesel, 1976 (Fair)	15,000*
4630 diesel, 1976 (Good)	13,500*
4630 diesel, 1977 (Good)	14,300*
4640 diesel, (New)	31,000*
5020, 1970 (Fair)	6000*
8630 diesel, 1976 (Fair)	22,000*
8630, 1976 (Good)	24,000
300, backhoe, ldr.,	3700

ALLIS-CHALMERS TRACTORS

B, 1949 (Good)	650*
C, cult.,	450
C, cult., plow, 1950 (Fair)	950
G, 1950 (Fair)	1100*
WD, 1950 (Fair)	600
WD, 1950 (Rough)	460
WD-45, 1952 (Fair)	1150
WD-45, 1952 (Fair)	775
D-14, (Good)	850*
D-15, 1967 (Fair)	1800
D-17 diesel, 1964 (Fair)	1450
D-17, 1965 (Fair)	3800
D-21, 1967 (Fair)	4700
185 diesel, 1972 (Good)	7000*
190-XT, 1965 (Fair)	2900
190-XT diesel, 1966 (Fair)	3425
190-XT diesel, 1967 (Good)	4750*
190-XT diesel, 1967 (Fair)	3750*
190-XT diesel, 1970 (Good)	5900*
200 diesel, 1971 (Good)	7100*
200 diesel, 1970 (Fair)	7700*
210, 1971 (Good)	5600*
220 diesel, 1968 (Good)	5100
220 diesel, 1974 (Fair)	3700*
5040 diesel, 1975 (Fair)	2825
5040, 1974 (Fair)	3550*
5040, 1980 (Good)	5100*
7030 diesel, 1974 (Good)	7100
7030 diesel, 1974 (Fair)	8200*
7030 diesel, 1974 (Fair)	6650

MASSEY-FERGUSON TRACTORS

35 diesel, 1958 (Fair)	2100*
50, 1960 (Rough)	1110
65, (Good)	1750
65, 1962 (Fair)	2400*
135, 1968 (Good)	2250
135.	3150
165 diesel, 1969 (Good)	3300*
165 diesel, 1967 (Rough)	3150*
175 diesel, 1969 (Fair)	4400*
175 diesel, 1969 (Rough)	3100*
175 diesel, 1967 (Fair)	3000
180 diesel, 1971 (Good)	3300*
275, 1977 (Good)	6150
1080, (Fair)	3650*
1100 diesel, 1968 (Fair)	2750
1100 diesel, 1968 (Good)	3600
1105 diesel, 1975 (Fair)	7500*
2705, 1979 (Good)	17,000*
2805, 1978 (Good)	18,000*
2135	3850

Condition classifications: EXCELLENT means—Engine: in perfect condition, 400 to 600 hours of use: Rubber: 80% tread remaining, no breaks or cracks; Paint: original and bright: General Appearance: excellent.

GOOD means—Engine: good running condition; Rubber: 70% tread remaining, no breaks or cracks; Paint: original paint or a good repaint job; General Appearance: good over-all.

FAIR means—Engine: possibly in need of a minor overhaul to restore; Rubber: 60% tread remaining, some cracking evident in side walls: Paint: only fair, weathered and some rust apparent; General Appearance: worn, some dents, minor parts such as gage covers missing or broken.

ROUGH means—Engine: obviously in need of a major overhaul; Rubber: smooth; Paint: scarred, weathered, rusty, needs painting urgently; General Appearance: dents, ruptures, broken parts, loose wires, some components such as lights broken, missing or inoperative.

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SO-CAL FORD'S 'PROFIT PARTNERS'

page 8

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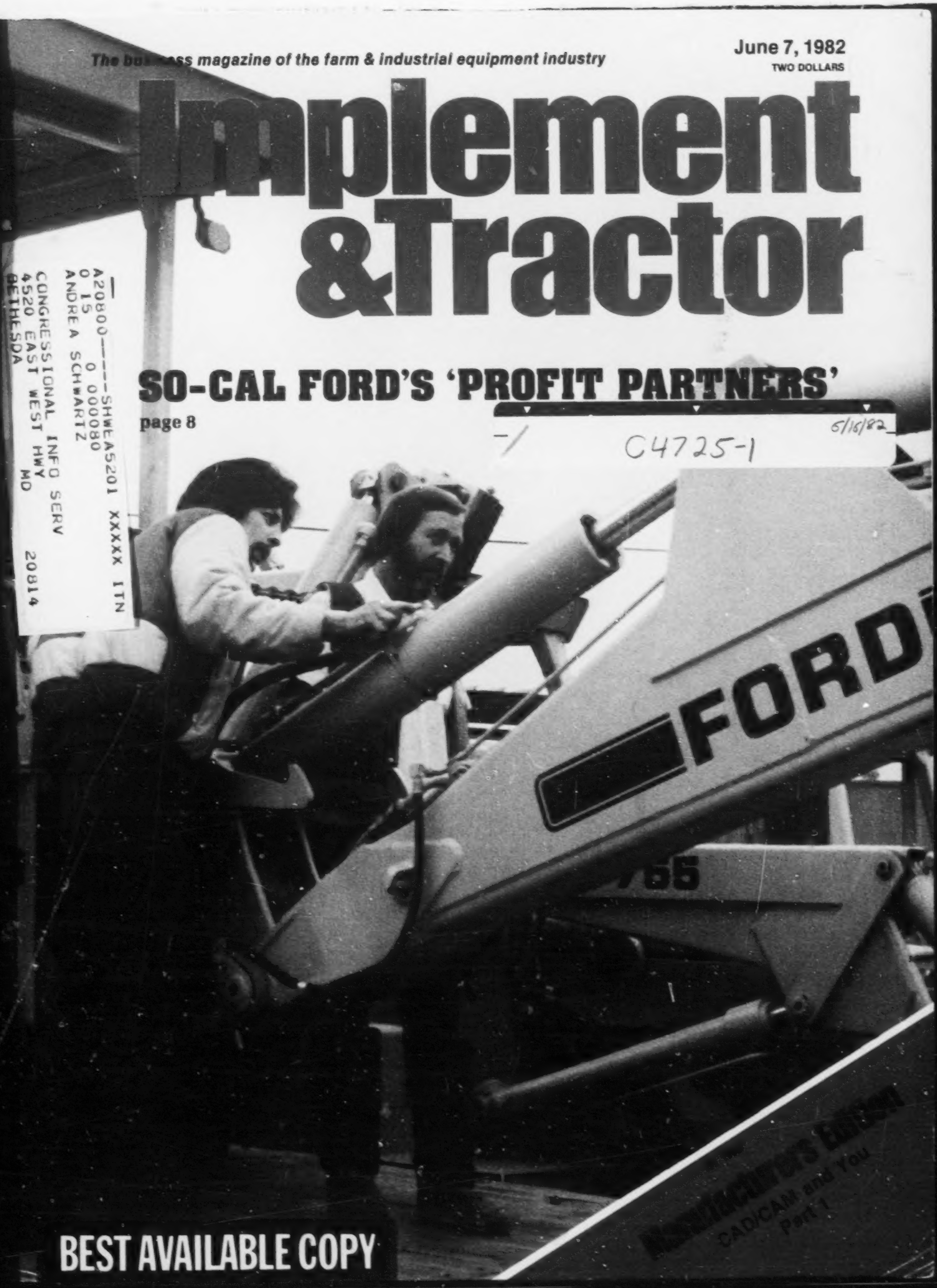

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Implement &Tractor

The business magazine of the farm & industrial equipment industry

June 7, 1982 • Vol. 97 • No. 13

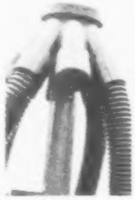
'YEAR OF THE SALESMAN' FOCUSES ON INCENTIVES

8: **"Profit Partners" at So-Cal Ford Tractors.** Jim Anderson set up his salesmen's incentive pay program to reflect the quality of the deals they generate. Additional incentives are added on tough-to-move items.

10: **Making Special Sales Incentive Programs Work.** Walt Buescher, our sales commentator, recalls special incentive campaigns that got the job done. One rule: Keep it simple.

12: **Sales Forecast Update by Marketing & Management Conference.** The revised sales outlook is less optimistic for the remainder of 1982. Marketing executives expect dollar volume of farm equipment retail business to be off by 3 per cent from 1981.

18: **Checking Out Those Air Seeders.** Studies of the recently arrived air seeder have been reported on by the Prairie Agricultural Machinery Institute and by ag engineers at Iowa State and Kansas State universities.



34: **Deals and Promotions.** This is a quick look at current programs offered by manufacturers to help their dealers move products.

Ford
Tractors
Equipment

On the cover... Pete Carrera is one of the So-Cal Ford salesmen. Here, he's checking out inventory on the lot. On the cover, he's pointing out features to a prospect.

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What's Ahead...

June 7, 1982

U.S. RETAIL SALES THROUGH APRIL showed declines in all product categories listed by the Farm & Industrial Equipment Institute's monthly flash report. A further piece of downbeat news is that the increase in sales of tractors over 100 horsepower recorded in March was an error. March volume in that product category actually was down 15.4 per cent, rather than up by 2.8 per cent, as indicated earlier. The full April flash report:

	Unit Retail Sales					
	April			January-April		
	1982	1981	Pct. Change	1982	1981	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
40-100 hp	4,364	5,958	-26.8	14,269	17,234	-17.2
Over 100 hp	3,146	4,846	-35.1	12,099	13,979	-13.4
Total 2-wheel drive	7,510	10,804	-30.5	26,368	31,213	-15.5
4-wheel drive	777	1,091	-28.8	2,704	3,410	-20.7
Total Tractors	8,287	11,895	-30.3	29,072	34,623	-16.0
Combines (S-P)	590	920	-35.9	2,960	4,739	-37.5
Balers*	386	670	-42.4	1,302	2,138	-39.1
Forage Harvesters**	172	269	-36.1	787	991	-20.6
Mower-Conditioners	623	862	-27.7	2,186	2,944	-25.7

*Bales under 200 lbs. **Shear-bar type.

NATIONWIDE CROP LOSSES FROM AIR POLLUTANTS may be as high as $5 billion, says Anton Endress, U. of Illinois botanist, and that is only counting the effects of ozone on corn, soybeans, wheat and peanuts. He added that the losses are probably even greater because of other pollutants for which there are no good figures, such as acid rain. Endress says that sulfur dioxide and nitrogen oxides primarily result from burning coal; in the presence of sunlight, the nitrogen oxides and hydrocarbons react chemically to convert some of the oxygen into ozone.

INTERNATIONAL CONFERENCE ON PLANT AND VEGETABLE OILS AS FUELS, set for Aug. 2-4 at the Fargo, N.C., Holiday Inn, will feature over 50 papers covering such topics as fuel specs and additives, short- and long-term engine performance and durability, and oil production. Sponsor is the American Society of Agricultural Engineers, with co-sponsorship by 21 other groups. Featured speaker is Melvin Calvin, U. of California, winner of the Nobel Prize in chemistry.

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THE 1982 SALES OUTLOOK
(Retail sales of units, United States)

	As It Looked In January		As It Looked In May	
Product	Unit Sales	Pct. Change From 1981	Unit Sales	Pct. Change From 1981
Tractors				
Under 40 HP	48,000E	+0.8	47,300E	− 1.0
40-99 HP	51,000	+0.1	49,500	− 2.9
100 HP and over	43,350	+0.4	43,200	+ 0.1
Four-wheel drive	10,265	+6.1	9,625	− 0.6
Total over 40 HP	105,700	+1.8	102,800	− 1.0
S-P Combines	27,755	+3.5	25,000	− 6.8
Corn Heads	18,040	+7.4	15,500	− 1.3
Forage Harvesters (1)	7,900	+3.9	7,500	− 1.4
Conventional Balers (2)	13,500	−0.8	13,200	− 3.3
Big Balers (3)	17,000E	+3.1	16,450	0.0
Windrowers	6,600	−1.5	5,950	− 9.9
Mower-Conditioners	18,900	+2.0	18,150	− 2.0
Moldboard Plows	17,000E	−8.1	16,650E	−10.0
Disk Harrows	47,500E	+5.3	42,430E	− 5.7
Field Cultivators	14,650E	+4.7	14,000	0.0
Chisel Plows	14,100E	+4.8	13,175	− 2.0
Grinder-Mixers	6,700	+7.2	6,350	+ 1.8
Manure Spreaders (4)	13,350	+1.9	13,350	+ 1.9

E – I&T estimates. (1) Shear-bar type. (2) Bales under 200 lbs. (3) Bales over 200 lbs. (4) Box type.

Source: Farm & Industrial Equipment Institute

FIEI Marketing & Management Conference

HANGING IN FOR THE SHORT TERM

By Bill Fogarty

Will total dollar retail sales be down 3 per cent this year? That's the median "State of the Industry" forecast for the rest of 1982. The long-term outlook is seen as pretty good – for survivors.

Robert L. Green, marketing manager for the J I Case Agricultural Group, delivered the report to the FIEI Marketing & Management Group at Ohio State U. May 20.

■FORECAST TIME has come again. The Farm & Industrial Equipment Institute's Marketing & Management Conference met at Ohio State U. May 20-21 and delivered its semi-annual consensus sales outlook report.

An update of its January forecast covering 1982, with a brief peek at 1983, the outlook report takes the views of industry marketing executives, who predict percentage changes up or down in unit sales of products they handle, and comes up with a median figure.

The hopes expressed last January for modest improvements in most product categories had given way to lesser expectations in May. Unit sales at the start of the year had been expected to go up in all product categories except balers (bales under 200 lbs.), windrowers, and moldboard plows. The second round of forecasts indicated *1982 declines in all products* except tractors over 100 hp, big balers, field cultivators, grinder-mixers and manure spreaders.

In terms of overall dollar volume, the group indicated that 1982 would show a decline of 3 per cent from 1981 business. However, the 45 participants in that estimate saw variations over a wide area. Seven predicted increases of 4 to 7.5 per cent. Fifteen executives saw dollar volume ending up plus 3 to minus 3 per cent; nine others predicted it would be down anywhere from minus 4 to minus 7 per cent. And 13 more picked the decline from minus 8 to minus 20 per cent.

When the FIEI marketing executives get to estimating the fortunes of individual product groups, industry-wide, the spread can be very narrow or very substantially dispersed. Some examples:

Total tractors: Nine participants; top estimate, up 1.2 per cent; the

(More...)

Sales Forecast *(continued)*

low, down 3.2 per cent; median, down 1.0 per cent.

Forage harvesters: Nine participants. One sees a whopping 37 per cent increase, another calls it down 15.8 per cent. The rest are scattered between plus 1.3 and off 7.9 per cent. Median—down 1.4 per cent.

Four-wheel-drive tractors: There are 12 participants in this estimate, running their picks from up 5.3 to off 12.2 per cent. Median is off 0.6 per cent.

up 5 to 10 per cent next year over last year.

Tractors: Five participants ranging from plus 1 to plus 10 per cent; median—plus 8 per cent.

Combines: Four estimates from up 11 per cent to down 7 per cent. Median is up 3.5 per cent.

Hay and forage equipment: Seven forecasts from up 12 per cent to down 19 per cent. Median—up 2 per cent.

Tillage and crop equipment: Seven estimates from up 10 per cent to no change from 1981. Median is plus 8 per cent.

AGRI-EQUIPMENT SALES FORECASTS, 1982, 1983

(Per cent change, retail dollar volume)

Product Group	As It Looked In January		As It Looked In May
	1982	1983	1982
Chemical Application Equipment	+ 6.0	+ 5.0	+ 5.0
Portable Augers, Elevators	+ 5.0	+ 10.0	+ 5.0
Bin-Type Crop Dryers	+ 10.0	+ 10.0	+ 10.0
Batch, Continuous-Flow Crop Dryers	0.0	+ 8.0	– 7.5
Farmstead Equipment			
Dairy, Beef	0.0	+ 10.0	0.0
Hogs	+ 3.0	+ 13.0	+ 2.5
Grain Bins	+ 10.0	+ 10.0	+ 10.0
Milking Machines	0.0	+ 5.0	– 5.0

Source: Farm & Industrial Equipment Institute

Moldboard plows: One executive sees a moldboard resurgence this year of 20 per cent. The other six see unit volume down anywhere from about 1 per cent to 17 per cent.

Balers (under 200 lbs.): Five participants, two seeing a dip of 1.1 per cent; the biggest pessimist says it will slide to 6.9 per cent. Median—minus 3.3 per cent, a fairly tight cluster.

Changes in 1983

The group took a limited shot at forecasting 1983. Forty-three of them predicted that overall unit sales would be up a median of 5 per cent over *1981* results. The group was forecasting a spread, however, of plus 15 (three participants) to minus 15 per cent (two others). Twenty of the group saw sales going up 5 to 10 per cent next year over last year.

Long-term outlook

In both the January and May questionnaires, marketing executives were asked to write in their views about both the short-term and long-term outlooks of the industry.

In January, most of the responses talked of difficulties in the near future, weak sales for several months ahead, and bright prospects for the rest of the decade, starting in late 1982 or 1983.

Four months later, the responses were generally on the same track, with the arrival of an upturn tending to be delayed. Similarly, the long haul appears favorable through the 'eighties. However, this time there is more reference to "surviving companies" sharing in a future prosperity.

What respondents said in January appeared in I&T Feb. 7 (page 4, "What's Ahead"). What follows are quotes extracted from the May survey.

"**Long term,** stronger companies will (form) a viable, profitable industry. There could be spot shortages of equipment during rebuild cycle."

"**Demand** for U.S. foods and grain will increase farmer profits after 1985 and into the 1990s. Those who survive will make money."

"**Short term**—debt repayment will take precedent over capital purchases."

"**Long term** may be good, but just how many will be around to participate?"

"**Survivors** will be larger and experience a boom business as pent-up demand is released. Demand will exceed supply of farm equipment for 12 to 18 months as recovery begins."

"**Even if conditions** improve, the industry will never regain its mid-seventies size."

"**Tough in 1982,** but good to excellent throughout the 1980s."

"**This decade,** as a whole, should produce unprecedented demand for farm equipment due to growing world population, high exports, world agricultural development."

"**Industry will** show a turnaround in April, 1983, with a gradual up-

(Continued on page 28)

Comment

I&T has sometimes dished out what may have appeared to be a collective spanking to participants in this semi-annual concensus forecast. Actually, our complaint has been against those who don't estimate by the house rules. The idea is to predict what a product's sales will be—across all brands and around the country. Some forecasters appear to be predicting the fate only of their own products, and many of these are strong in certain parts of the country and weak in others. Since the FIEI "State of the Industry" forecast is the only public device of its type, it deserves all the sober consideration that can be brought to it.

But as for expecting the industry's marketing executives to be able to predict the trends that will move farm equipment sales up or down...that's just too much to ask. To make an accurate call, the forecaster would have to have a faultless long-range weather prediction; an understanding of political currents in Latin America, the Soviet Union, the Common Market, Japan and the U.S.; insight as to what Congress will do next, and worldwide cash reserves available for grain purchases. Good luck to all forecasters.

—Bill Fogarty

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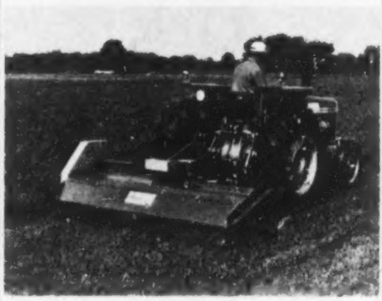

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(Continued on page 30)

Sales Forecast

(Continued from page 14)

turn to November, 1984. Democrats winning in 1984 will provide better farmer income for four years; if not, more of the same."

"**1982**—more emphasis on minimum and no-till farming and equipment. 1980s—same plus greater emphasis on fuel-efficient tractors due to the rapid rise in diesel prices."

"**The only** short-term assistance will be for those companies who become much more aggressive from a sales standpoint. They may experience reduced profit as a reflection of give-away programs. In the longer run, we will see many more mergers plus some old established concerns demise."

"**Slow turnaround** starting late 1982, gradual increase through 1983 into an average 1984. Increasing at an exaggerated pace through 1985 and 1986, peaking 1987 or 1988."

"**Long term:** Survivors will be strong."

"**Continued** repairing of equipment always stops at some point. It can't go on forever." I&T

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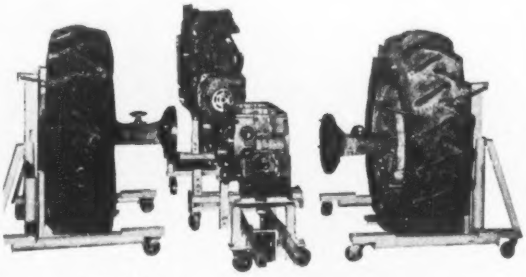

- 60 Day satisfaction guarantee
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- One man installation in less than 5 minutes
- Heavy 6" castors for easy roll

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HPC-15
HITCH PIN CLIPS

HPC-15 Assortment
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#100 AG
COTTER PINS

AG Assortment
Contains 100 plain or plated pins with complete range of sizes. 10 plastic boxes per display carton.

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WESTERN WIRE
PRODUCTS COMPANY
1415 South 18th St. • St. Louis, Mo. 63104

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The business magazine of the farm & industrial equipment industry

June 21, 1982
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Implement & Tractor

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ANDREA SCHWARTZ
CONGRESSIONAL INFO SERV
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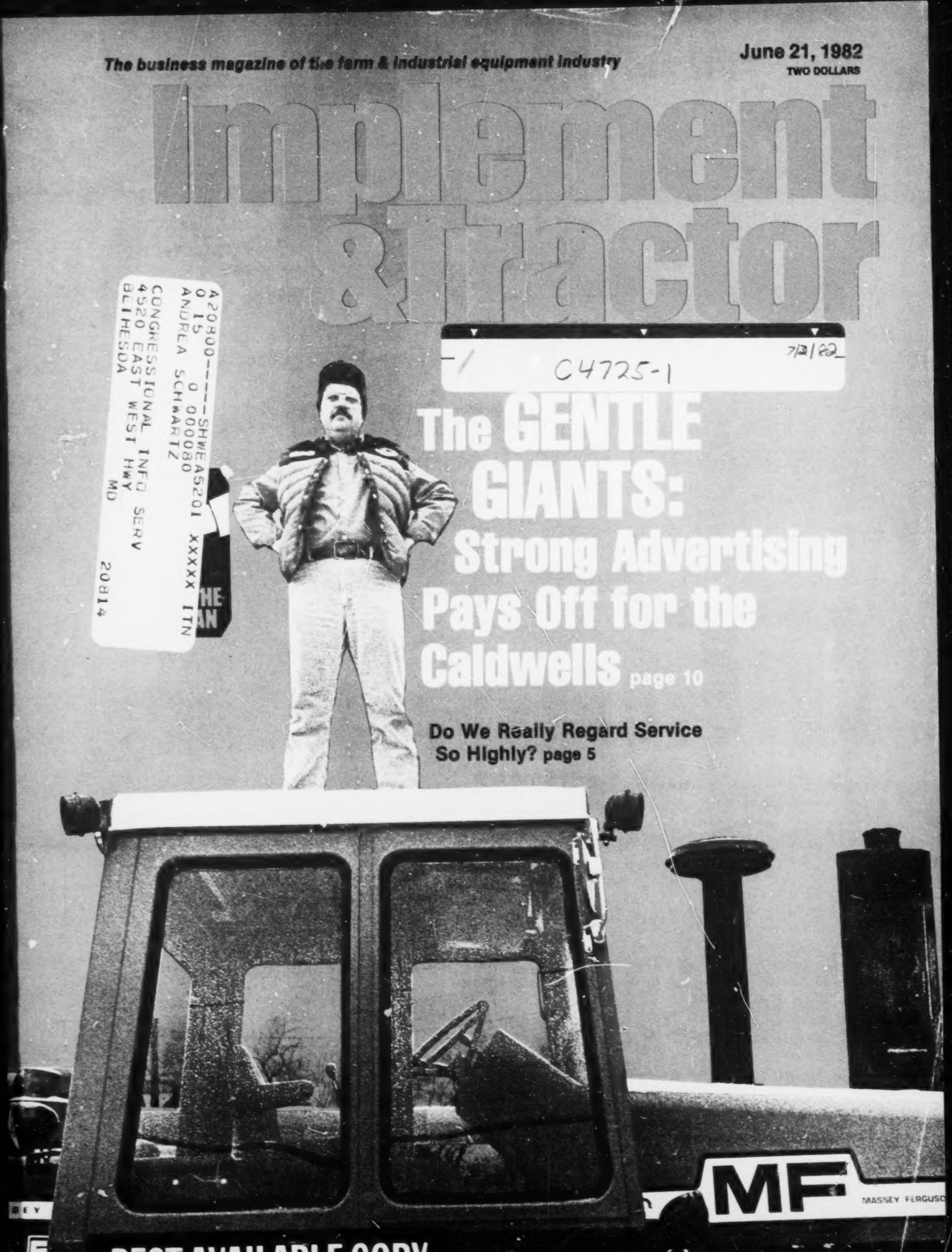
BETHESDA MD 20814

The GENTLE GIANTS: Strong Advertising Pays Off for the Caldwells page 10

Do We Really Regard Service So Highly? page 5



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ABP **A member of American Business Press**

ABC **A member of Audit Bureau of Circulation**

ADVERTISING
Lou McNeill, Production
(Regional advertising sales offices
listed on ad index page.)

ADMINISTRATION
R. J. Hancock, President
Edward F. Mickells, Publisher

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INTERTEC PUBLISHING CORP.

Implement & Tractor

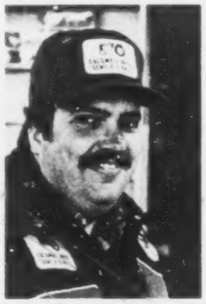
The business magazine of the farm & industrial equipment industry

June 21, 1982 • Vol. 97 • No. 14

8: **Back to the Campus for Management Insights.** Marketing & Management Conference of FIEI goes to Ohio State U. for a five-professor seminar covering topics such as agriculture's future, leasing's pros and cons, product liability today, managerial concepts, and changing lifestyles and their impact on the marketplace. Extra attraction: NBC's Irving R. Levine.

10: **Caldwell Brothers – the Gentle Giants – Give It 100 Per Cent.** They haven't been in business long, but the Caldwells at Canton, Mo., have made themselves known with a strong promotional effort and a relentless schedule of direct calls. "I enjoy selling farm equipment," says Dan, "but it hasn't been easy. I wouldn't want to do anything else in the world."

14: **Plan to be a Winner.** Part of the selling battle, says Walt Buescher, I&T's special contributor on "Year of the Salesman" topics, is to sell yourself on the idea that you can overcome the adversity that we all face. Then it's a matter of conveying this positive attitude to the customer.



On the cover... Dan Caldwell of Canton, Mo., hard-working Massey dealer, tries to make at least 20 cold calls on customers each week.

DEPARTMENTS

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RETAIL SALES OF WHEEL TRACTORS*
(In Units)

	Total Wheel Tractors†				Cumulative for Jan.-Mar., 1981				Cumulative for Jan.-Mar., 1982			
	Mar. 1981		Mar. 1982		Farm Type				Farm Type			
	Farm	Non-Farm	Farm	Non-Farm	2-Wheel Drive	4-Wheel Drive	Total Farm	Non-Farm	2-Wheel Drive	4-Wheel Drive	Total Farm	Non-Farm
Alabama	166	33	116	26	374	13	387	66	289	6	295	50
Alaska	2	2	1	3	6	.....	6	13	6	......	6	3
Arizona	70	33	42	21	183	19	202	87	152	26	178	114
Arkansas	279	46	180	29	714	118	832	82	404	44	448	60
California	437	223	246	91	973	88	1,061	567	711	61	772	250
Colorado	127	51	71	26	255	53	308	121	168	34	202	76
Connecticut	23	14	15	9	34	1	35	33	29	1	30	30
Delaware	11	.....	17	2	30	1	31	9	26	2	28	11
Florida	195	107	190	60	550	13	563	275	398	15	413	146
Georgia	276	53	162	32	656	9	665	124	460	9	469	84
Hawaii	11	9	4	11	17	3	20	18	12	1	13	19
Idaho	228	19	130	5	338	61	399	51	209	48	257	24
Illinois	472	66	439	40	999	202	1,201	166	1,066	201	1,267	107
Indiana	227	31	187	19	515	90	605	84	464	98	562	67
Iowa	518	18	477	10	1,332	158	1,490	43	1,291	134	1,425	22
Kansas	211	39	240	15	482	127	609	72	620	119	739	44
Kentucky	329	78	373	20	840	12	852	145	771	5	776	40
Louisiana	271	94	173	52	609	74	683	170	377	17	394	153
Maine	23	5	14	3	46	1	47	18	62	1	63	6
Maryland	32	51	43	12	93	9	102	98	108	4	112	42
Massachusetts	4	32	10	19	23	.....	23	62	33	.....	33	46
Michigan	164	71	172	36	420	74	494	165	429	63	492	78
Minnesota	418	26	356	7	862	150	1,012	74	792	122	914	29
Mississippi	268	29	136	19	583	70	653	77	387	29	416	45
Missouri	283	48	278	26	623	70	693	105	636	73	709	75
Montana	77	14	82	10	167	47	214	36	157	42	199	29
Nebraska	289	11	237	12	670	75	745	37	748	76	824	28
Nevada	14	12	9	4	28	.....	28	24	14	3	17	12
New Hampshire	2	4	13	5	10	.....	10	18	30	.....	30	12
New Jersey	26	27	27	24	56	.....	56	78	58	1	59	62
New Mexico	39	23	24	9	85	10	95	70	116	3	119	27
New York	167	67	163	51	395	33	428	167	370	30	400	116
North Carolina	275	44	221	33	713	11	724	126	602	11	613	69
North Dakota	196	4	262	9	323	192	515	13	440	209	649	19
Ohio	280	71	228	38	636	86	722	170	536	66	602	81
Oklahoma	163	69	199	81	363	56	419	177	489	49	538	224
Oregon	73	28	70	2	198	25	223	79	224	26	250	21
Pennsylvania	167	73	188	37	402	19	421	185	390	13	403	107
Rhode Island	.....	6	1	2	2	.....	2	13	2	.....	2	4
South Carolina	99	32	77	18	271	6	277	76	208	6	214	55
South Dakota	136	6	153	7	311	66	377	16	381	42	423	16
Tennessee	231	39	239	32	565	21	586	86	544	13	557	78
Texas	712	407	658	221	1,891	122	2,013	853	1,941	90	2,031	698
Utah	44	47	37	15	157	9	166	74	105	7	112	42
Vermont	25	8	26	3	59	.....	59	11	43	3	46	6
Virginia	148	40	162	26	323	5	328	112	371	8	379	50
Washington	137	31	117	19	289	50	339	63	282	39	321	45
West Virginia	31	12	37	7	65	.....	65	37	70	.....	70	11
Wisconsin	374	43	284	21	740	59	599	96	679	67	746	72
Wyoming	44	13	28	7	83	9	92	52	69	10	79	24
U.S. Government	3	14	.....	1	4	.....	4	32	1	.....	1	5
Miscellaneous‡	9	30	32	64	46	.....	46	116	88	.....	88	213
TOTAL	**8,806**	**2,354**	**7,646**	**1,351**	**20,409**	**2,317**	**22,726**	**5,544**	**18,858**	**1,927**	**20,785**	**3,747**

Data released May 20, 1982, Farm & Industrial Equipment Institute.

*Figures do not include garden tractors, motor tillers or contractors off-highway types. Report includes units marketed by these firms: Allied Farm Equip. (Leyland Satoh); Allis-Chalmers; Belarus; J I Case; Deere; Deutz; Ford; International Harvester; Long; Massey-Ferguson; R. M. Wade (Satoh); Steiger; Versatile; and White.

†The monthly sales are those reported for that month only. The cumulative totals are subject to revision reflecting updating in the basic sales data.

‡Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

I&T
SINCE 1886

AUCTION PRICES OF USED EQUIPMENT

An exclusive I&T monthly report of actual prices paid recently at these leading national wholesale auctions.

Asterisk beside tractor price indicates highest bid offered on tractors which were not sold.

JONES FARM EQUIPMENT CO.
Dothan, Alabama
May 11, 1982

CASE TRACTORS

1690 diesel, 1981 (Excellent)	12,000
580 diesel, ldr., backhoe, 1972 (Fair)	4000*

DEUTZ TRACTOR

6006 diesel (Fair)	2300*

MASSEY-FERGUSON TRACTORS

1100 diesel, 1966 (Fair)	3000
1085 diesel, 1974 (Fair)	4200
275 diesel, 1975 (Excellent)	6350*
245 diesel, 1979 (Excellent)	5950
180 diesel, 1968 (Good)	3250*
180 diesel, 1966 (Good)	3150*
180 diesel, 1966 (Fair)	2450
180 diesel, 1966 (Good)	3250*
175 diesel, 1972 (Fair)	2950*
175 diesel, 1967 (Good)	3200
175 diesel, 1967 (Good)	3500
175 diesel, 1967 (Good)	3450*
175 diesel, 1967 (Good)	3300
3165 diesel, 1968 (Rough)	1850*
165 diesel, 1975 (Rough)	2350*
165 diesel, 1974 (Good)	3600*
165 diesel, 1968 (Good)	3000
165 diesel, 1966 (Fair)	2550
135, 1970 (Excellent)	3500
135, 1970 (Excellent)	3300*
135, 1970 (Excellent)	3500
135, 1969 (Good)	2600
135, 1968 (Good)	2575
65 diesel, 1961 (Fair)	1300
65 diesel, 1960 (Good)	1725
50, 1959 (Fair)	1125
35, 1963 (Good)	1900*
35, 1956 (Good)	1750
35, 1956 (Fair)	1350*
TO30, 1952 (Fair)	650

FORD-FERGUSON TRACTOR

9N, 1946 (Fair)	700

FORD TRACTORS

8600 diesel, duals, 1974 (Rough)	2950
8600 diesel, 1971 (Good)	4600
8000 diesel, 1970 (Fair)	3500
7000 diesel, 1975 (Good)	5250*
6000 diesel, 1961 (Fair)	1000
5600 diesel, 1976 (Good)	7900*
5000 diesel, 1968 (Good)	4200
5000 diesel, 1965 (Fair)	3400
4000 diesel, 1972 (Good)	4100*
3000 diesel, 1968 (Fair)	2600
3000 diesel, 1966 (Good)	3200
3000 diesel, 1966 (Good)	3150*
2000, 1974 (Rough)	2300
2000, 1967 (Good)	2700
1700 diesel, 1979 (Excellent)	4600*
851, 1958 (Good)	1800
841 diesel, 1958 (Fair)	1450
641, 1960 (Good)	1950
640, 1957 (Fair)	1175
640, ldr., 1955 (Good)	1900
640, 1955 (Good)	1750
Sup. Maj. diesel, 1962 (Rough)	400
Jub., 1953 (Good)	1750
Jub., 1953 (Good)	1650*
Jub., 1953 (Fair)	1100
8N, 1951 (Good)	1325
8N, 1951 (Good)	1150
8N, 1950 (Good)	1350*
8N, 1950 (Good)	1150
8N, 1950 (Good)	1200
8N, 1949 (Fair)	1000

INTERNATIONAL HARVESTER TRACTORS

1466 diesel, 1973 (Fair)	5000
664 diesel, 1972 (Rough)	1900*
560 diesel, 1959 (Rough)	625*
504, 1963 (Rough)	500
504, 1963 (Fair)	1200
444 diesel, 1968 (Fair)	875
404, 1964 (Good)	1350
400 diesel, 1955 (Fair)	600
284 diesel, 1978 (Good)	4050*
140, cult., plt., plow, 1966 (Good)	3050
140, cult., plt., 1960 (Good)	2675*
130, 1957 (Good)	1800
A, 1944 (Fair)	300
Cub Loboy, mo., 1963 (Good)	1100
Cub, cult., plt., plow, 1953 (Excellent)	1650
Cub, mo., 1951 (Good)	1300
Cub, cult., plt., 1948 (Good)	1350*

JOHN DEERE TRACTORS

3020 diesel, 1965 (Rough)	2150
3010 diesel, 1962 (Good)	2700*
2630 diesel, 1975 (Good)	5900
2630 diesel, 1974 (Good)	5250*
2040 diesel, 1978 (Good)	5600
2020 diesel, 1977 (Good)	3350*
2010 diesel, 1962 (Fair)	1350
1530 diesel, 1974 (Good)	3750
1010 diesel, ldr., 1961 (Good)	1600
430, 1958 (Fair)	1025*
B, 1951 (Good)	400
MT, 1952 (Fair)	360
M, cult., plt., plow, 1950 (Excellent)	1450

LONG TRACTOR

384 diesel, (Fair)	800*

YODER & FREY, INC.
Archbold, Ohio
May 10 & 11, 1982

INTERNATIONAL HARVESTER TRACTORS

A	580
154 Loboy (Fair)	1400*
Sup. C, 1952 (Rough)	575
H, 1947 (Fair)	600
M, 1947 (Rough)	740
M, 1947 (Fair)	800*
Sup. M, 1952 (Fair)	825
Sup. M, 1947 (Good)	750
Sup. M, 1947 (Good)	830
300, (Good)	500*
300,	640
350, 1957 (Fair)	875
2400, 1965 (Good)	2500*
400, ldr., 1956 (Rough)	1700*
400, 1956 (Rough)	900*
400, 1956 (Fair)	875
434 diesel, 1961 (Fair)	2550
460, 1961 (Fair)	1225*
460 diesel, 1960 (Good)	1725*
504, 1964 (Rough)	1900*
560 diesel, 1960 (Fair)	2500
560, 1959 (Rough)	1325
560, 1958 (Good)	1600
656, (Good)	3000*
656, 1968 (Fair)	3600*
806 diesel, 1965 (Rough)	3000
806 diesel, 1965 (Fair)	3700*
806 diesel, 1965 (Good)	4400
806 diesel, 1963 (Good)	4500*
856, 1969 (Good)	4350
986, 1978 (Good)	8400*
986 diesel, 1979 (Good)	13,500
1066 diesel, 1976 (Good)	10,700*
1086, 1978 (Good)	16,000*
1206 diesel, 1965 (Fair)	5525
1256 diesel, 1968 (Fair)	5900*
1466 diesel, 1975 (Good)	9700*
1466 diesel, 1975 (Good)	8600*
1566 diesel, 1974 (Good)	11,200*
1586 diesel, 1979 (Good)	14,750*
1586 diesel, 1978 (Good)	14,000*
3788,	28,000*
TD-6,	1875
Sup. MTA,	840
Sup. MTA, 1954 (Good)	1175

JOHN DEERE TRACTORS

A	300
B, 1948 (Good)	650
G, 1950 (Fair)	725*
40, cult., 1954 (Fair)	1350*
60, 1953 (Rough)	775*
60, 1954 (Rough)	450
420, 1947 (Fair)	950*
620, 1956 (Rough)	535
520, 1956 (Fair)	1450*
520, 1952 (Good)	1450
720, 1956 (Rough)	1850
1530 diesel, 1978 (Excellent)	4700*
2010, 1962 (Rough)	1700
2010 diesel, 1962 (Rough)	1275
2630 diesel, (Good)	7400*
3010 diesel, 1961 (Rough)	3000*
4010, 1963 (Fair)	2950*
4020 diesel, 1968 (Good)	7200
4020, 1964 (Fair)	5100*
4020 diesel, 1966 (Good)	6450*
4020 diesel, 1968 (Good)	6700*
4020 diesel, 1965 (Fair)	5400*
4020 diesel, 1965 (Fair)	5600*
4020 diesel, 1969 (Good)	6400*
4230, 1976 (Good)	10,400*
4320, 1973 (Good)	8800*
4430 diesel, 1975 (Good)	15,000
4430 diesel, 1975 (Fair)	12,450
4430 diesel, 1975 (Good)	13,600*
4440,	28,750*
4440, 1978 (Good)	18,250*
4630 diesel, 1977 (Good)	14,100*
4630, 1975 (Good)	11,500*
5020 diesel, 1967 (Good)	6250*
5020, 1967 (Good)	5000

FORD TRACTORS

8N, 1952 (Good)	1975
8N, 1950 (Rough)	835
8N, 1952 (Good)	1775
8N,	1100
9N, 1947 (Rough)	750
9N, 1946 (Fair)	800
800, ldr., 1956 (Fair)	2725
3000 diesel, 1966 (Fair)	3200
4000 diesel, 1973 (Fair)	2850*
4000, ldr., 1971 (Fair)	3200
4000, ldr., 1967 (Fair)	2900
7000, 1975 (Good)	6000
8600, 1975 (Fair)	7000*
9600, 1972 (Good)	8500*
5600, 1980 (Excellent)	7900
4500, ldr., 1976 (Good)	6800
Jub., 1953 (Fair)	1125
Jub., 1953 (Fair)	1225*

WHITE TRACTOR

4-150, 1973 (Good)	9000*

DAVID BROWN TRACTORS

990, 1962 (Fair)	1625
1200 diesel, 1963 (Fair)	2600
1212 diesel, 1972 (Rough)	2475

ALLIS-CHALMERS TRACTORS

C, 1950 (Rough)	450
CA, cult., 1952 (Good)	940
CA, cult., 1951 (Good)	828
G, 1950 (Good)	1150
WD-45, 1953 (Fair)	450*

FOR MORE INFORMATION *...on products advertised or described in this publication, use...* **I&T's Handy Reply Card**

As a free service for our readers, we forward your inquiry to manufacturers in whose products you are interested. I&T's Handy Reply Card is preaddressed.

D-17, 1964 (Fair)	1925
D-17 diesel, 1966 (Rough)	925
D-17, Idr., 1960 (Good)	1675
185 diesel, 1972 (Good)	6900*
200 diesel, 1972 (Good)	8000*
210 diesel, 1972 (Fair)	5600*

CASE TRACTORS

D	330
450, Idr.,	6500*
430 diesel, 1963 (Good)	1100
480 Idr.,	2400*
530, 1966 (Fair)	2900*
830, 1966 (Fair)	2700*
830 diesel, 1967 (Rough)	1500*
830, 1965 (Fair)	1050
930 diesel, 1963 (Good)	3000*
930 diesel, 1967 (Fair)	2600
1030 diesel, 1968 (Fair)	4000
1270 diesel, 1972 (Good)	8500*
1270 diesel, 1975 (Fair)	9000*

MASSEY-FERGUSON TRACTORS

TO-20, 1947 (Fair)	935
TO-30, 1951 (Rough)	1050
TO-30, 1951 (Fair)	1225
TO-30, 1948 (Fair)	1325
TO-35, 1958 (Good)	1430
65 diesel, 1961	2700*
135, 1967	2650
135, 1963 (Good)	2750*
165 diesel, 1974 (Good)	4400*
165, 1970	3000
175 diesel, 1970 (Rough)	3200*
175 diesel, 1968 (Rough)	3100*
175, 1963 (Fair)	2625
180 diesel, 1972 (Rough)	3225
180, 1973 (Good)	2050*
1085 diesel, 1975 (Fair)	5650
1085, (Fair)	6200*
1105,	7600
1130, 1969 (Fair)	4950
1800 diesel, 1973 (Good)	9000*
1800, (Rough)	9000*
2705, 1979 (Good)	16,000*

OLIVER TRACTORS

77, 1951 (Rough)	310
Sup. 55, 1954 (Fair)	1275*
1600, 1961 (Rough)	1700*
1650, 1965 (Fair)	3100*
1650, 1967 (Fair)	2475*
1655, 1972 (Good)	5400*
1850 diesel, 1967 (Good)	3450
1855, 1971 (Fair)	5400*

DEUTZ TRACTORS

D9006, (Fair)	3100*
D13006, (Fair)	7700*
4600, (Fair)	1700

COCKSHUTT TRACTORS

30, 1951 (Fair)	675
540,	800
1650 diesel, 1966 (Good)	3200

MASSEY-HARRIS TRACTOR

Pony, 1950 (Fair)	1600

MINNEAPOLIS-MOLINE TRACTORS

A4T-1600, 1971 (Good)	7300*

NOTES

Prices reported are for individual sales at wholesale on "as is," "cash and carry" basis.
Prices reported are NOT averages.

Condition classifications: EXCELLENT means—Engine: in perfect condition, 400 to 600 hours of use; Rubber: 80% tread remaining, no breaks or cracks; Paint: original and bright; General Appearance: excellent.

GOOD means—Engine: good running condition; Rubber: 70% tread remaining, no breaks or cracks; Paint: original paint or a good repaint job; General Appearance: good over-all.

FAIR means—Engine: possibly in need of a minor overhaul to restore; Rubber: 60% tread remaining, some cracking evident in side walls; Paint: only fair, weathered and some rust apparent; General Appearance: worn, some dents, minor parts such as gage covers missing or broken.

ROUGH means—Engine: obviously in need of a major overhaul; Rubber: smooth; Paint: scarred, weathered, rusty, needs painting urgently; General Appearance: dents, ruptures, broken parts, loose wires, some components such as lights broken, missing or inoperative.

DEMONSTRATOR means—used for demonstrating only and in practically new condition.

Don't sell too low...
and don't pay too much...
stay up-to-date on used equipment values with I&T

Delco's
"Mean Blue Machine"
for the farm equipment dealer

880 S HESSTON
DELCO

It pays
to use it . . .
if you can keep it
around that long.

Delco pressure washers fit right into your farm equipment business for two good reasons: 1) They're an easy sale and a quick lease 2) They're ideal for use in your service department . . . if you can keep one on hand that long! Call or write today for more information.

Dealer-Distributor inquiries invited

DELCO

Delco Mfg. Co., Inc.
P.O. Box 69, Siloam Springs
Arkansas 72761
Ph.: (501) 524-6471 • TLX-TWX 910-720-7263

Circle (4) on Reply Card

***turbo*® Precleaners**

The No. 1 PRECLEANER

turbo II
turbo
turbo
turbo
turbo II
turbo II
turbo II

Eliminates up to 99% of dust, dirt, chaff, rain and snow!
- Extends filter life up to 10 times longer.
- Extends engine life.
- No exhaust connections.

Traffic stopping display moves precleaners off the shelf.
- Low inventory requirement — fast turnover.
- Advertising in leading farm publications.
- Full one year warranty.

SURECO
4701 HUMBOLDT AVENUE NORTH • MINNEAPOLIS, MN 55430
PHONE (612) 529-9166

Circle (5) on Reply Card

RETAIL SALES OF SELECTED FARM EQUIPMENT — Jan.-Mar. 1981 and 1982(1)

(In Units)

	Combines Self-Propelled		Corn Heads		Hay Balers(2)		Windrowers Self-Propelled Power Units		Windrowers Self-Propelled Total Heads		Grinder-Mixers		Shear-Bar Forage Harvesters(3)	
	1981	1982	1981	1982	1981	1982	1981	1982	1981	1982	1981	1982	1981	1982
Alabama	23	6	4	1	30	5	.....	1	.....	1	25	22	3	4
Alaska	.....	.....	.....	.....	2	2	.....	.....	.....	.....	.....	.....	.....	.....
Arizona	28	11	1	4	13	3	19	8	20	8	1	5	3	4
Arkansas	174	43	1	3	29	7	.....	.....	.....	.....	23	12	2	.....
California	68	19	9	12	47	18	84	45	96	50	2	3	12	5
Colorado	56	50	17	29	26	20	23	10	21	12	19	10	5	5
Connecticut	.....	.....	.....	.....	2	4	.....	.....	.....	....	.....	1	3	4
Delaware	6	3	3	2	2	.....	.....	.....	.....	.....	2	3	.....	.....
Florida	9	7	5	.....	15	9	.....	.....	.....	.....	7	2	2	8
Georgia	44	37	14	13	28	21	.....	.....	.....	.....	19	27	9	6
Hawaii	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Idaho	68	20	.....	– 1	42	26	42	17	43	20	8	8	3	5
Illinois	390	300	316	317	31	26	3	.....	2	– 1	135	95	36	20
Indiana	215	131	197	118	35	13	1	.....	.....	.....	86	65	13	15
Iowa	373	316	342	315	46	23	18	10	17	9	357	253	47	37
Kansas	338	219	25	17	39	34	57	31	57	30	60	59	12	20
Kentucky	52	24	23	16	42	20	6	.....	1	.....	73	82	27	12
Louisiana	47	19	.....	1	4	3	.....	.....	.....	.....	4	2	2	1
Maine	.....	.....	.....	.....	2	2	.....	.....	.....	.....	1	1	2	4
Maryland	14	11	21	13	14	5	1	2	1	3	9	9	7	5
Massachusetts	.....	.....	.....	.....	4	3	.....	.....	.....	.....	.....	1	2	1
Michigan	70	39	55	55	19	15	4	1	4	1	63	57	39	20
Minnesota	221	159	148	104	92	54	54	50	57	58	176	152	66	51
Mississippi	67	21	2	1	20	6	.....	.....	.....	.....	14	7	4	2
Missouri	140	86	44	49	38	22	2	3	2	3	124	99	17	11
Montana	81	43	.....	.....	25	13	37	30	41	37	14	17	2	4
Nebraska	200	171	141	110	19	11	37	30	40	35	129	124	25	35
Nevada	1	.....	.....	.....	3	7	6	1	5	2	.....	.....	.....	.....
New Hampshire	.....	.....	.....	1	7	4	....	.....	.....	.....	1	.....	.....	2
New Jersey	3	1	4	2	2	6	.....	.....	.....	.....	3	3	2	1
New Mexico	9	3	.....	2	16	17	9	5	9	5	3	1	.....	2
New York	12	22	16	22	45	36	5	4	6	4	32	26	38	49
North Carolina	41	27	37	28	31	23	.....	.....	.....	......	45	25	5	11
North Dakota	210	115	6	20	7	4	49	36	51	38	45	37	4	4
Ohio	148	70	122	82	62	44	1	1	1	1	93	79	31	25
Oklahoma	146	90	1	4	54	24	18	16	18	15	33	36	2	1
Oregon	38	18	2	3	33	33	22	18	26	21	7	4	8	3
Pennsylvania	23	22	16	20	71	66	8	7	7	7	83	77	40	42
Rhode Island	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
South Carolina	26	8	3	7	6	5	.....	.....	.....	.....	15	7	7	.....
South Dakota	80	46	25	28	6	4	52	36	55	53	77	62	23	20
Tennessee	41	27	7	10	70	23	.....	.....	.....	.....	46	53	13	11
Texas	218	107	21	28	104	55	15	4	16	6	56	63	12	9
Utah	2	3	.....	.....	18	23	14	12	14	12	3	3	3	4
Vermont	.....	2	.....	2	6	3	.....	.....	.....	.....	1	.....	6	13
Virginia	10	14	8	16	42	29	.....	.....	.....	.....	18	33	13	15
Washington	61	16	4	2	20	27	19	7	21	7	2	2	12	9
West Virginia	.....	.....	.....	.....	19	8	.....	.....	.....	.....	4	7	.....	1
Wisconsin	55	41	62	70	168	93	38	22	39	23	147	124	158	114
Wyoming	11	3	1	1	12	17	14	8	14	9	6	4	2	.....
U.S. Government	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miscellaneous (4)	.....	.....	12	.....	.....	.....	.....	1	.....	1	.....	.....	.....	.....
TOTAL	**3,819**	**2,370**	**1,715**	**1,527**	**1,468**	**916**	**658**	**416**	**684**	**470**	**2,071**	**1,762**	**722**	**615**

Data released May 20, 1982, Farm & Industrial Equipment Institute.

(1) Includes revisions for prior months.
(2) For making bales of under 200 lbs.
(3) Pull-type, mounted, self-propelled.

(4) Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra plant or company transfers, etc.

Mower Conditioners All Types 1981	1982	Manure Spreaders Conveyor-Type 1981	1982	
11	9	4	.....	Alabama
1	1	.....	.....	Alaska
1	.....	1	2	Arizona
42	33	30	21	Arkansas
10	6	20	14	California
15	10	19	13	Colorado
7	6	20	20	Connecticut
1	2	24	5	Delaware
12	11	4	1	Florida
32	22	10	9	Georgia
.....	1	.....	.....	Hawaii
17	6	35	35	Idaho
92	79	200	164	Illinois
63	33	185	107	Indiana
148	63	519	449	Iowa
82	60	58	60	Kansas
115	76	89	79	Kentucky
7	15	6	5	Louisiana
7	4	10	12	Maine
9	10	56	54	Maryland
4	5	22	12	Massachusetts
59	23	243	165	Michigan
117	68	387	384	Minnesota
11	13	8	5	Mississippi
140	118	82	80	Missouri
22	13	6	8	Montana
77	56	61	78	Nebraska
1	.....	1	5	Nevada
5	4	7	11	New Hampshire
1	5	12	11	New Jersey
1	3	4	1	New Mexico
79	64	475	412	New York
37	25	35	38	North Carolina
11	10	17	18	North Dakota
91	46	288	216	Ohio
59	61	8	19	Oklahoma
30	14	18	37	Oregon
67	103	392	314	Pennsylvania
.....	.....	.....	1	Rhode Island
21	10	4	5	South Carolina
16	8	59	57	South Dakota
80	117	39	36	Tennessee
103	89	45	48	Texas
15	21	34	27	Utah
8	11	49	47	Vermont
61	68	49	74	Virginia
26	13	30	29	Washington
15	16	20	12	West Virginia
248	129	637	552	Wisconsin
5	3	9	8	Wyoming
.....	.....	.....	.....	U.S. Government
.....	.....	.....	.....	Miscellaneous
2,082	**1,563**	**4,331**	**3,760**	**TOTAL**

Editor's Notebook

(Continued from page 5)

farmer was asked if he wanted any or all problem areas taken care of, and he was offered a 10 per cent discount on replacement parts. The service labor involved was charged at the regular retail rate.

Each inspection session was scheduled for the morning. When it was completed, the dealer took the customer to lunch.

Results: The mechanic-turned-salesman signed up 20 combine inspections. That's $3,580 for starters. The combines that underwent repairs (most of them did) produced parts and service sales revenue ranging from $2,000 to $5,000 per unit.

After I heard what this dealer had done, I passed the story on to some industry marketing people. Guess what they asked every time: "Did the dealer get any of those combine owners to trade?"

As I heard the story, the dealer did not. This suggested to me not that the dealer lacked salesmanship smarts. Rather, I'll bet he was a shrewd judge of current market realities as they affect his customers. He knew he had slim wholegoods sales chances, so he went after an alterante revenue source.

That dealer sent about 20 combines back to the farm that were just about like new. Did he outsmart himself?

I don't think so. True, those farmers can now postpone a combine purchase for a while, but consider how the dealer has positioned himself with regard to getting their business next time. Consider also how he has helped his customer stay in good operating condition. And made some money himself.

If that dealer had been hell-bent to push through a lot of sales with this project, he probably could have gotten some. But those farmers would have shopped the competition, too, right? And the competition would have plucked off some of those deals and squeezed the margin on others to the point of being invisible. Perhaps that dealer evaluated the margin-in-hand from the inspection deal versus the margin-in-the-bush from a sale or two and liked the former over the latter.

Should others do it? This dealer's story is *not* passed along to suggest that everyone should try the idea. Chances are, only a minority of dealers have the right service technician for the job. Instead, I am urging dealers to think creatively about the asset they have that makes them different from farm supply stores, catalogs, discount houses, "agents" and everyone else—their servicing capacity.

In its broadest sense, service is the lifeblood of this business. Who can deny it? So why isn't it embraced, elevated, exalted, marketed creatively, treated with respect—even *enjoyed?* It's a challenge for everybody—not just dealers and distributors but manufacturers and, indeed, anyone else who makes his living from this stuff.

Long Mfg. Fell Out of the List of Big Ad Spenders; Sorry, Don Granberg!

Donald R. Granberg is vice-president and general manager of Davenport operations for Long Mfg. N.C. Don read the item in Editor's Notebook, May 7, which listed the big spenders in print advertising among farm equipment companies, as supplied by Agricom of St. Joseph, Mo.

After several minutes of intense reading which led to acute eyestrain, Don concluded correctly that somebody had goofed. Long Mfg.'s name had been erroneously omitted from the list when I&T picked it up. And the writer of these lines, who always likes to hear from Don, even when he's got a beef, was the culprit.

For the record: In 1981, Long Mfg. N.C., according to Agricom, was 48th among the top 150 advertisers in 161 farm publications and ag trade magazines. By our count, they were 10th among farm machinery advertisers. Their 1981 outlay of $698,336 was a 49 per cent increase on their 1980 expenditure of $469,402, according to Agricom's data.

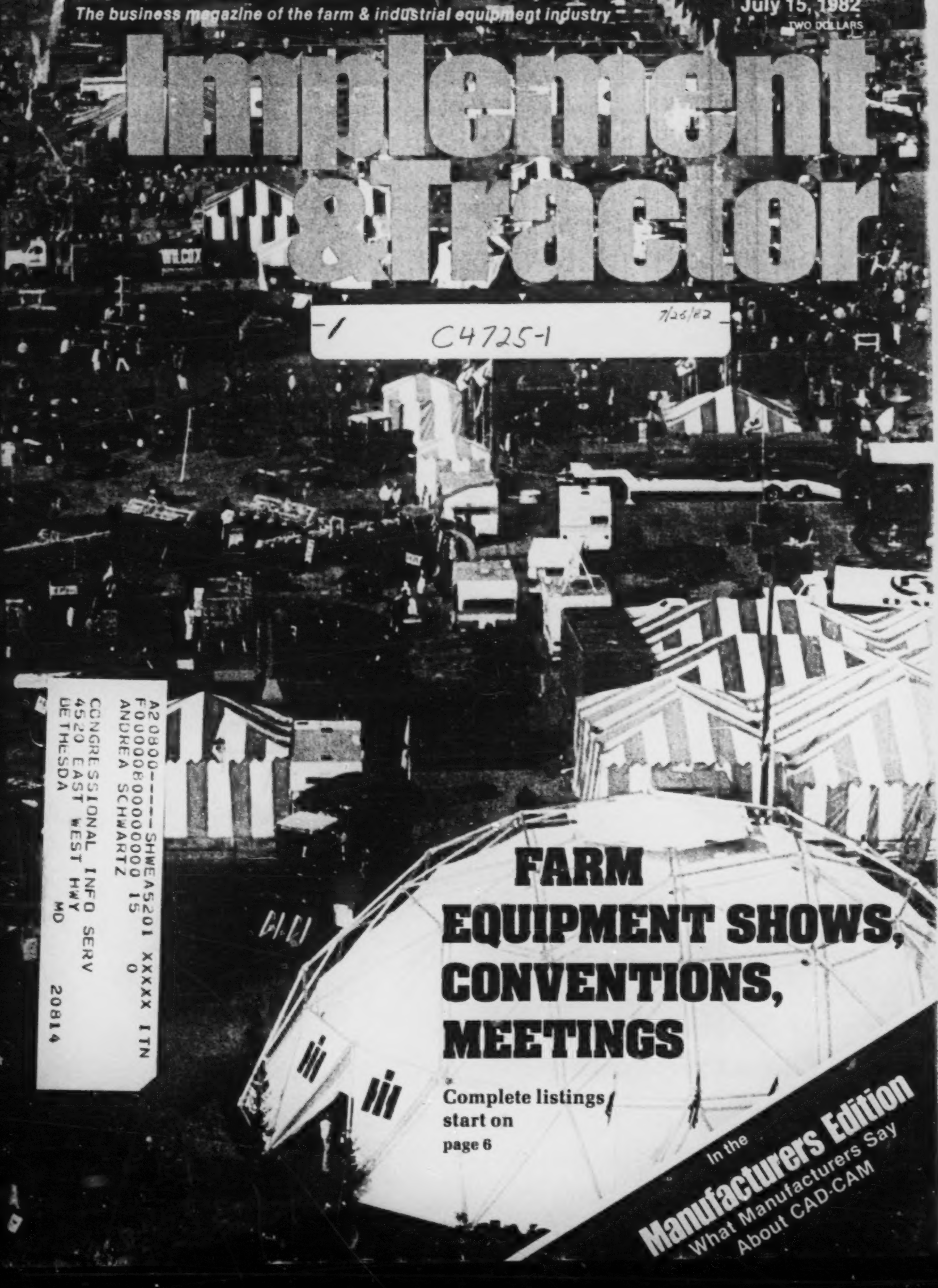
The business magazine of the farm & industrial equipment industry

July 15, 1982

TWO DOLLARS

Implement & Tractor

-1 C4725-1 7/26/82



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FARM EQUIPMENT SHOWS, CONVENTIONS, MEETINGS

Complete listings start on page 6

In the **Manufacturers Edition**
What Manufacturers Say About CAD-CAM

Implement &Tractor

The business magazine of the farm & industrial equipment industry

July 15, 1982 • Vol. 97 • No. 15

6: **Conventions, Meetings, Shows, 1982-1983.** I&T presents its annual listing of dealer association conventions, farm machinery shows in North America and overseas, professional association gatherings and state and regional fairs.

12: **Fuel Efficiency Debate.** Manufacturers respond to I&T's March 21 article that said today's tractors had an "unimpressive track record" in Nebraska Tractor Tests.

A SPECIAL FOCUS ON SERVICE MATTERS

Today, many farm equipment dealers are turning to their service and parts departments to make up for declines in sales of wholegoods. Here are articles that come to grips with two ever-present concerns in every shop—hand tools and hydraulics. Watch future issues for more.

28: **Hand Tools.** How well your people are equipped determines both productivity and customer satisfaction—and you can help.

32: **Farm Equipment Hydraulics: Reviewing the Basics, Getting Up to Date.** Types of hydraulic systems—open-center, closed-center, load-sensitive. What are their advantages and limitations? The first of a six-part series.

On the cover... Dealers and farmers view the newest farm machinery at the California Farm Equipment Show & International Exposition held last February in Tulare's International Agri-Center.

DEPARTMENTS

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What's Ahead...

I&T SINCE 1886

July 15, 1982

U.S. RETAIL SALES IN MAY CONTINUED THEIR DOWNWARD TREND, according to the Farm & Industrial Equipment Institute's flash report:

	Unit Retail Sales					
	May			January-May		
	1982	1981	Pct. Change	1982	1981	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
40-100 hp	3,383	4,917	-31.2	17,500	22,151	-21.0
Over 100 hp	1,795	3,153	-43.1	13,898	17,132	-18.9
Total 2-wheel drive	5,178	8,070	-35.8	31,398	39,283	-20.1
4-wheel drive	557	678	-17.8	3,262	4,088	-20.2
Total Tractors	5,735	8,748	-34.4	34,660	43,371	-20.1
Combines (S-P)	597	1,175	-49.2	3,557	5,914	-39.9
Balers*	675	1,234	-45.3	1,967	3,372	-41.7
Forage Harvesters**	259	453	-42.8	1,056	1,444	-26.9
Mower-Conditioners	1.389	1,991	-30.2	3,576	4,935	-27.5

*Bales under 200 lbs. **Shear-bar type.

CANADA'S RETAIL SALES THROUGH MAY ARE ALSO AILING, reports the Canadian Farm & Industrial Equipment Institute. For the first five months, tractor unit sales were down 30 per cent from 1981's 10,087 to 7,006, with the biggest decline coming in the over-100-hp group: down 35 per cent from 3,712 units to 2,404. Self-propelled combines were off by 44 per cent over the five months, falling from 882 to 494 units.

"JAPANESE CHALLENGE" CONFERENCE OF FIEI'S INDUSTRIAL-CONSTRUCTION EQUIPMENT DIV. produced these quotes: James F. Bere, chairman, Borg-Warner--"If (the Japanese) decide to make export of large ag and off-road equipment a new national goal, they will do it, whether or not from our standpoint they can afford it." Robert Hanson, president, Deere (& FIEI chairman)--"American inventiveness, drive and desire can be marshalled. Then we'll learn how to face their competitive challenge, and in so doing, emerge a stronger and more competent force in the global marketplace." Harold Malmgren, president, Malmgren, Inc.--"Japan's changes in technology are built around four key areas: computer telecommunications, biotechnology and bioengineering, energy alternatives and new materials. Among the latter: fiber optics (expected to replace all copper in communications by 1987), ceramics--being used to make diesel engines that can withstand -20°C and still fire up in three seconds, and carbon fiber--expected to replace almost all other materials in an airplane by 1990, as well as reinforcing rods in concrete...."

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FUEL EFFICIENCY DEBATE: MANUFACTURERS RESPOND

Remember the article (I&T Mar. 21) that said today's tractors had an "unimpressive track record" at Nebraska? The author asked for responses, and here's a summing up of what he got.

By Frank Buckingham

■GOOD NEWS! Everyone in this business is for fuel efficiency! We'll bet everyone's for motherhood, too.

Of course, some are willing to sacrifice a bit of apple pie and fuel economy for performance features that they perceive to be factors that really sell tractors. And they do affect sales. Higher capacity hydraulic systems, hydraulically actuated controls, air conditioning, shift-on-the-go transmissions and other improvements are real attractions.

Many of these features increase tractor productivity in the field even though they reduce apparent operating economy in Nebraska Tractor Tests. Buyers must decide if productivity and comfort are raised enough to offset the added fuel needed to operate the improvements.

Detractions...or Improvements?

At Purdue U., Prof. Bruce Liljedahl teaches a course called "Tractors" to ag engineering students. He gave them copies of the Mar. 21 article on fuel efficiency and asked them to respond to the issue. Said Bryan Murphy:

"A farmer's production efficiency is the function of more than just the power efficiency of his tractor. He must also consider timeliness....Is fuel consumed to power the steering system greater than the fuel saved by turning the tractor around more rapidly at the end of every row? Is fuel consumed by the hydraulic unit greater than fuel saved by the enhanced control ability of the tractor operator? If so, fuel efficiency could be improved by returning to manual steering and manual control systems.

"Such tractors, of course, would not sell in today's market. The point is that these systems, which appear to reduce fuel efficiency in constant load tests, very likely improve fuel efficiency in actual production duty...."

In I&T March 21, we had an article titled "The Industry's Tractor Fuel Efficiency—Not a Strong Track Record." We intended it to be thought-provoking, but some people found it just provoking.

We wanted to elicit some specific reasons for the apparent decline in fuel efficiency in recent years. Before the article came out, copies of it went to 11 industry representatives asking for comments or explanations for the seeming decline. We got nine responses. Three readers also wrote the author. So we suspect that most of the industry agrees with our position.

There were limited examples given of specific improvements, but the general response was that increased tractor sophistication increases productivity *and* fuel consumption, "but we're still working on fuel economy, too."

Cool takes fuel

Air conditioned cabs were often cited as features customers want and that take power. *But it is important to note that no tractor has been drawbar-tested at Nebraska with the air conditioner operating.* Such data will not be found in the test reports, and it was on test reports that the assertion of an "unimpressive track record" was made.

Some people misunderstood parts of the article. It was stated, for instance, that only wheeled diesel tractors were included in test comparisons. But one engineer said we had not included all his company's tractors tested from 1959 through 1970—and he provided a list that included nine gasoline and LP-gas tests. He said, "These averages radically affect the magnitude of change from the 1959-70 to the 1979-81 time frame and wouldn't appear to rate the emphasis shown in your article."

There was a vast difference in average economy of that firm's tractors between those time periods, but we couldn't condone averaging fuel economy of non-diesel and diesel engines together for any reason—certainly not just to offset the lower performance of newer diesel tractors.

This engineer concluded: "Our trend has been away from gasoline and LP tractors. This partially offsets the increased sophistication required by the marketplace in auxiliary hydraulics, (shift-on-the-go) transmissions, full power steering, air conditioning and increased electrical requirements. The marketplace has shown greater response to these areas than to fuel economy. We are, however, concentrating on improving future product lines." Similar statements were received from nearly every tractor manufacturer who responded.

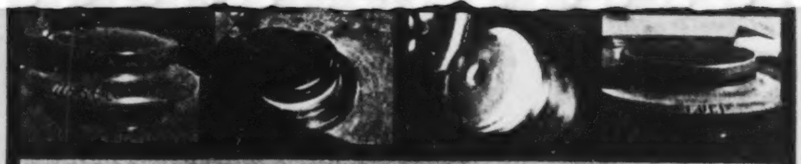
Simpson's comment

Bill Simpson of J I Case said, and I agree completely, that one should "never rely on one figure pulled out of a test as the sole measurement of the quality of performance. Consider that figure in relation to everything else shown in the test."

Simpson and others pointed out, quite correctly, that the manufacturer's objectives may vary according to the tractor submitted for test. For instance, testing without ballast is one means of attaining high drawbar horsepower while sacrificing pounds of pull.

Though many tractors will never be ballasted as heavily as those models tested at Nebraska, a few may carry more weight to the field. And virtually all tractors have some ballast added for heavy field work. So a test without ballast may not provide an accurate indication of potential tractor performance, either. Also, adjusting fuel flow to maximum design limits may provide maximum power output for the test—and drive down fuel economy sharply.

We did use only one portion of



OTHER PERSPECTIVES ON AVERAGE FUEL CONSUMPTION, 1959-1981

Manufacturer (No. of tests)	All tractors tested hp-hrs/gal 75% Max.	All tractors tested hp-hrs/gal 50% Max.	All tractors tested lbs/hp-hr 75% Max.	All tractors tested lbs/hp-hr 50% Max.	2-wheel drive lbs/hp-hr 75% Max.	2-wheel drive lbs/hp-hr 50% Max.	4-wheel drive lbs/hp-hr 75% Max.	4-wheel drive lbs/hp-hr 50% Max.
Allis-Chalmers (35)	12.15	10.24	0.575	0.628	0.572	0.679	0.612	0.745
Belarus (5)	13.63	11.97	0.513	0.584	0.521	0.593	0.500	0.570
Big Bud (1)	13.97	12.01	0.502	0.584	.....	.....	0.502	0.584
Case/David Brown (75)	12.81	11.23	0.544	0.620	0.543	0.617	0.552	0.643
John Deere (63)	11.96	10.17	0.585	0.688	0.589	0.692	0.547	0.650
Deutz (15)	13.99	12.35	0.499	0.565	0.499	0.565	.....	.....
FWD Wagner (2)	12.45	11.05	0.560	0.633	.....	.....	0.560	0.633
Ford (56)	12.42	10.81	0.561	0.646	0.562	0.645	0.555	0.659
Hesston-Fiat (13)*	13.17	11.44	0.534	0.618	0.534	0.618	.....	.....
International Harvester (71)	11.84	10.11	0.594	0.696	0.597	0.697	0.577	0.688
Kramer (1)	11.40	9.82	0.608	0.705	0.608	0.706	.....	.....
Kubota (16)	11.32	9.71	0.620	0.724	0.620	0.724	.....	.....
Lamborghini (1)	12.74	10.93	0.562	0.634	0.562	0.634	.....	.....
Leyland (5)	12.30	10.52	0.570	0.667	0.570	0.667	.....	.....
Long (8)	13.13	11.50	0.528	0.600	0.528	0.600	.....	.....
Massey-Ferguson (57)	12.45	10.80	0.565	0.655	0.562	0.647	0.587	0.703
Nuffield (3)	13.24	11.86	0.525	0.586	0.525	0.586	.....	.....
Porsche (2)	10.81	9.46	0.648	0.745	0.648	0.745	.....	.....
Same (3)	12.61	10.67	0.560	0.641	0.560	0.641	.....	.....
Satoh (1)	11.18	9.58	0.632	0.737	0.632	0.737	.....	.....
Steiger (21)	12.84	11.03	0.542	0.631	.....	.....	0.542	0.631
Ursus (2)	12.59	11.72	0.556	0.596	0.556	0.596	.....	.....
Versatile (5)	12.31	10.17	0.575	0.698	.....	.....	0.575	0.698
White (55)**	12.11	10.44	0.577	0.670	0.576	0.669	0.584	0.686
Yanmar (1)	11.95	10.37	0.578	0.666	0.578	0.666	.....	.....
Zetor (5)	13.38	11.24	0.523	0.636	0.523	0.636	.....	.....
Average (522)	12.37	10.67	0.568	0.658	0.568	0.658	0.560	0.660

(Nebraska Tests, 1959-1981, at 75 and 50 percent of Maximum Drawbar Load, wheeled diesel tractors)
*Includes Fiat tests before Hesston-Fiat
**Includes White, Minneapolis-Moline and Oliver tests

the Nebraska Tractor Tests for our fuel economy analysis, but we explained why. Unless you are comparing two identical tractor models, comparing gallons of fuel burned per hour or per acre is meaningless, so useful comparisons can only be made if figures are reduced to a common denominator.

What we said

So to quote from our earlier article: "A number of studies show that fuel consumption at 75 per cent of maximum drawbar load in the Nebraska Tractor Test is a reasonable approximation of tractor fuel consumption under load in normal field work. Other studies indicate that average annual fuel consumption for general work can be approximated by using fuel consumption at rated engine speed and 50 per cent of maximum drawbar load. *So these two tests have provided the basis for this study, and we've used hp/hrs/gal to put all tractors on an equal basis to show how much work each one can do on a gallon of fuel.*" (Emphasis added now.)

No one questioned use of those tests to approximate annual fuel use. On the basis of little apparent change in average results of those tests, it still appears that the industry has made little improvement in tractor fuel efficiency in the last quarter-century.

Efficiency of some current models is better than it was for earlier tractors, and many are capable of doing more work per day, or hour than their earlier counterparts. But, though most respondents insist that productivity of current tractors has improved, very few came forward with any quantitative measure of that improvement. It's questionable whether higher productivity of some current models can overcome as much as 17 per cent reduction in fuel efficiency compared with tractors of equal power (same paint color) tested earlier.

Pounds, not gallons

Some respondents complained that comparisons were made on a basis of hp-hrs/gal rather than lbs/hp-hr. Said one: "In no way can you compare the fuel being refined today with the fuel used 10 years ago—6.7 lbs. vs. 7 lbs. per gallon. This is about a 4 per cent difference. It is strongly suggested that you convert all fuel consumption rates to a standard mass."

So all 23 years of tests were rechecked and the chart converted to fuel consumption in lbs/hp-hr rather than hp-hrs/gal. (And we separated four-wheel-drive tractors at the same time. More of that later.)

Some minor errors in the original table were repaired, and Steiger people pointed out that we had not included some of their recently tested tractors. Copies of these 1981 tests didn't reach I&T in time for the Jan. 31, 1982 *Red Book*. Adding four models improved the Steiger average (1959-81) from 12.74 to 12.84 hp-hrs/gal at 75 per cent of maximum drawbar load and from 10.97 to 11.03 hp-hrs/gal at 50 per cent load. Other errors did not make significant changes in the averages.

Averages followed the same pattern regardless of whether fuel was measured in pounds or gallons. All tractors tested in 1979-81 used an average of 1.9 per cent more pounds of fuel at 75 per cent load compared with the average for 1959-70 tests. The comparable tests were 2.2 and 3.5 per cent for fuel use in hp-hrs/gal.

So, to check further, the average weight per gallon of diesel fuel was determined from reports for four different years. *If the quality of fuel has deteriorated as badly in recent years as some people say, the U. of Nebraska is to be commended for getting very high quality fuel.*

(More...)

Averages for the years checked were: 1959—7,009 lbs/gal; 1969—6.936; 1980—7.027; and 1981—6,966.

Thus, the lightest fuel used in those particular years was burned in 1969, several years before fuel quality supposedly began to deteriorate badly. The heaviest was used in 1980.

Four-wheel drives

Fuel use in lbs/hp-hr was averaged separately for four- and two-wheel-drive tractors in response to suggestions. Overall average fuel use by four-wheelers for 1959 was slightly lower compared with two-wheelers: 0.560 and 0.660 vs. 0.568 and 0.658 lbs/hp-hr respectively for 75 and 50 per cent of maximum drawbar load. This hardly amounts to the vast differences predicted by some readers. Differences between types was so small that the averages for all tractors were exactly the same as those for two-wheelers.

Deere, Ford and International Harvester four-wheelers used fewer lbs/hp-hr than did each company's average two-wheelers. But A-C, Case, MF and White two-wheelers had higher average efficiency than did their four-wheelers.

More viewpoints

Jim Merriman, Jr., of George Merriman Inc., Spokane, Wash., dealer for Versatile, said, "Versatile introduced the Cummins 'Constant Power' engine design into its tractor lineup in 1978. In Nebraska Test 1332, the 875 Versatile (280 hp) produced 14.35 hp-hrs/gal under heavy drawbar load at 2100 rpm. However, this tractor was able to produce 15.82 hp-hrs/gal at 1900 rpm with no loss in torque (actually, torque increased)....The 'Constant Power' engine eliminates the need for full throttle under even the heaviest loads. More work is produced per gallon at a lower engine speed with less engine wear...."

R. W. Beaman, Steiger Tractor, Inc., said: "The article does not acknowledge the fuel efficiency at lower operating rpm levels (e.g., 1700 rpm). Steiger's engine options (Cummins, Caterpillar) provide high torque rise capability. The operator can throttle back to a lower rpm, maintain the same or higher horsepower and enjoy a higher fuel efficiency...."

Steiger's average efficiency at 75 per cent load improved 5.1 per cent for 1979-81 tests vs. 1971-78 tests, and 3.6 per cent at 50 per cent of maximum load.

Jim Callaway, Hesston's tractor product manager, said: "A two-wheel drive would test better at Nebraska (on concrete), because of reduced drive train power losses. In the field, true efficiency will increase at least 20 per cent (with front-wheel assist)."

P. E. Lockie, White Farm Equipment, observed: "Removing the results of 36 oriental tractors tested during the 1971-81 period (produces) an improvement of up to 1.5 per cent in fuel efficiency at 75 per cent and 50 per cent maximum loads, as compared to the previous periods (1959-70)....We believe the oriental tractors will improve in fuel efficiency in the future."

A **Massey-Ferguson** engineer noted that the lower efficiency of Japanese tractors sold by MF cut the efficiency average of all Massey

(More...)

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units. Also, the 2000 series units have two-pump, open-center hydraulic systems, which take more power than earlier MF versions. Current big models, he said, were designed before fuel became a major cost factor. Future models, he added, will re-emphasize fuel efficiency.

Bill Simpson of Case: "All our over-100-hp 90 series have substantial fuel savings over prior models. In a standby condition, the pressure flow compensated hydraulic system only requires about 2.8 hydraulic hp—substantially lower than previous hydraulic systems."

Comparing the Case 1370 and 2390 models, Simpson says: "This efficiency achievement was the result of removing many parasitic forces:...16 parasitic horsepower were taken from the 2390 engine, resulting in improved fuel economy, more usable pto and drawbar power, and lower sound level."

Deere & Co. spokesmen cited Deere's Dy [illegible] an example of their efforts to improve fuel efficiency. The device can be used to field test tractors through repeatable computerized loading that removes the impact of varying soil conditions from test results. Noting that "the bottom line is field efficiency and productivity," they add that "a full power shift transmission may show about 4 per cent less efficiency than a simple transmission in tests, but it can provide 10 per cent or more improvement in actual field productivity."

European tractors

Fuel use in lbs/hp-hr, averaged by manufacturer for all tests in the 23-year period, showed Deutz scoring most efficient at both load levels. Other European-based lines posting high efficiencies were Belarus, Long and Hesston-Fiat.

Europeans have for many years paid much more for fuel than North Americans. European designers emphasized fuel efficiency a long time before the energy crunch hit this continent.

It is also inferred by some American tractor makers that foreign tractors generally lack the features found in their own models, even though most smaller tractors sold here are imports, regardless of brand.

We asked several manufacturers what is being sacrificed by European makers in performance or comfort to attain high fuel efficiency. The only specific answers were that "hydraulic systems may not be comparable to those of U.S. tractors" and "an air-cooled engine is inherently more efficient, but I suspect it costs more to produce than a liquid-cooled model."

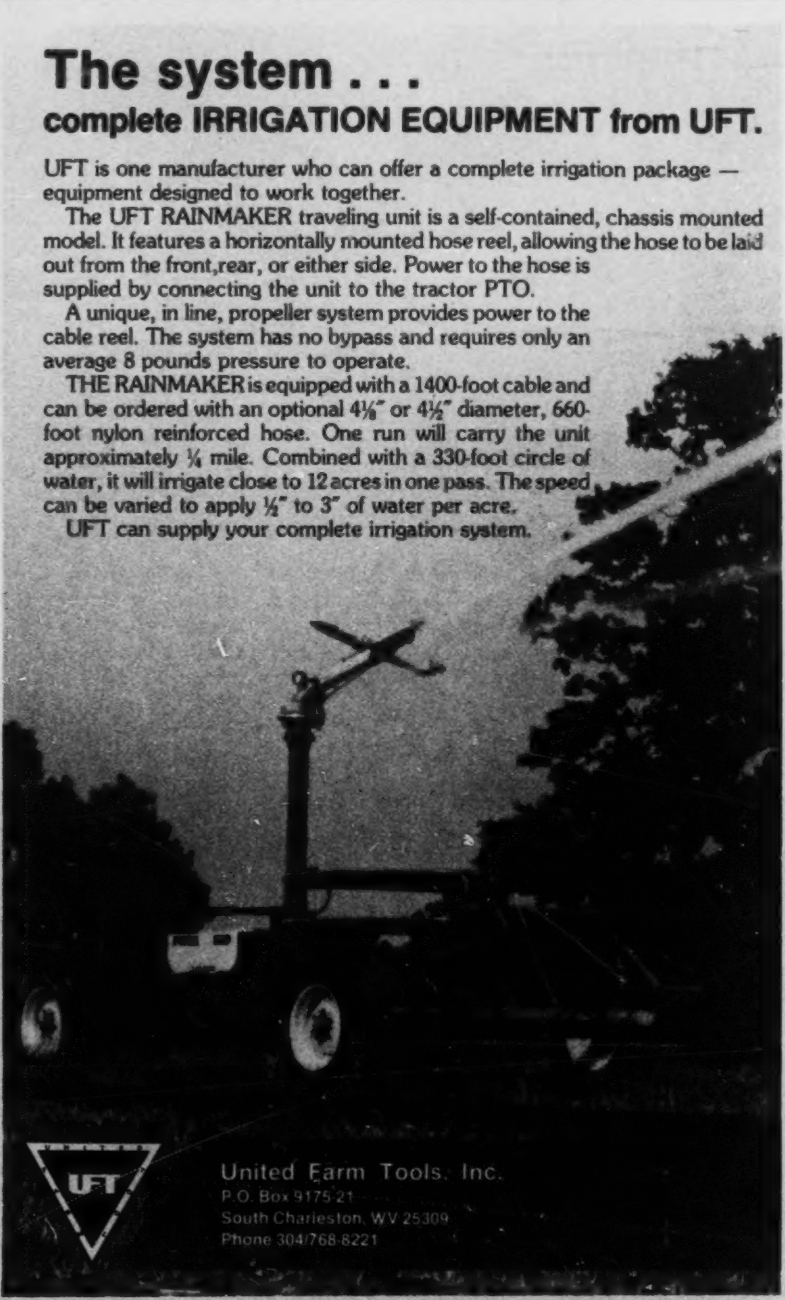
Frank Kaplan, Deutz vice-president, marketing, says: "How does Deutz do it? Not by sacrificing comfort, convenience or performance, but by minimizing waste."

What next?

So where do we stand now? Tractor makers around the world are trying to improve fuel efficiency. They're also providing the comfort and performance features buyers want, even though many of these features consume engine power before it reaches the pto or drawbar.

The need for better fuel economy is obvious. An Oklahoma study

(More...)



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recently reported in *Successful Farming* indicates that fuel and lubricant costs increased from 25 to 34 per cent of total tractor costs from 1970 to 1980.

In the past, farmers have voted with their dollars for more features, but now fuel efficiency appears to be drawing more votes than before. I&T

Industry in Motion

Chromalloy Farm Equipment Div., Kewanee, Ill., has appointed Ken Anderson, **Anderson Sales Co.**, Carrington, N.D., as a manufacturer's representative for its Kewanee, Schwartz and Arps product lines in North Dakota and northern Minnesota.

Dynamic Industries, Inc., Barnesville, Minn., has named Ken Bauer as in-plant sales manager.

Dale Stacker has been appointed district sales manager for **Badger Northland Inc.**, Kaukauna, Wis., and will oversee wholesale sales and direct dealer development and new dealer recruitment in central and eastern Ohio.

Gilson Brothers Co., Plymouth, Wis., has announced the acquisition of two product lines, portable heaters and high-pressure washers, formerly marketed by Century Engineering Div., Ex-Cell-O Corp., Cedar Rapids, Iowa.

The **Hub City Div.**, **Safeguard PowerTech Systems**, Aberdeen, S.D., has announced the signing of an assembly/manufacturing license agreement with **S. E. Opperman, Ltd.**, London, England, which covers sales and marketing rights for the Poweratio I line of concentric shaft helical gear reducers.

Kohler Co., Kohler, Wis., has named James M. Roenitz as vice-president, generators, and George R. Tiedens vice-president, engine and advanced technology group. Arthur G. Kroos, Jr., general manager of the company's Engine Div., and a veteran of 43 years with Kohler, plans to retire in August of this year.

The business magazine of the farm & industrial equipment industry

August 1982
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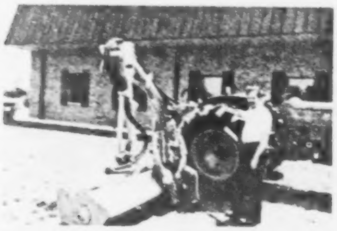
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10: **Cylinders and Motors in Performance.** Actuators function on very simple principles, but real-life conditions can affect their performance. This is the second article in our series on farm equipment hydraulics

16: **Working on Ads, Sales Promotion.** Wait Buescher, our sales commentator, tells how to find the optimum level of spending for ads and promotions to give your salesmen the backup they need.

20: **Are Your Shop's Key Profit Indicators Current?** Many dealers underestimate their shop expenses. Figuring your shop wage-shop rate ratio can help you evaluate your billing efficiency.

28: **Can a Dealer Make it as a Distributor?** Sonny Parsons grew gradually from a tractor retailer to a multistate distributor. I&T takes a look at how one dealer found his niche and expanded accordingly.

35: **Learning to Listen for Needs.** Two Oregon salesmen tell how their training in sales and in personal development paid off, both on and off the job.

On the cover... The mechanic's wages are one of the most clear-cut expenses in a shop—assessing the other expenses can be more difficult.

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What's Ahead...

August 1982

U.S. RETAIL SALES OF FARM EQUIPMENT IN JUNE continued their downward progression, according to the flash report of the Farm & Industrial Equipment Institute. The numbers:

	Unit Retail Sales					
	June			January-June		
	1982	1981	Pct. Change	1982	1981	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
40-100 hp	4,144	4,592	- 9.8	21,741	26,743	-18.7
Over 100 hp	2,163	2,853	-24.2	16,062	19,985	-19.6
Total 2-wheel drive	6,307	7,445	-15.3	37,803	46,728	-19.1
4-wheel drive	509	662	-23.1	3,771	4,750	-20.6
Total Tractors	6,816	8,107	-15.9	41,574	51,478	-19.2
Combines (S-P)	1,092	1,799	-39.3	4,649	7,713	-39.7
Balers*	1,777	2,670	-33.4	3,740	6,042	-38.1
Forage Harvesters**	580	809	-28.3	1,633	2,253	-27.5
Mower Conditioners	3,510	4,566	-23.1	7,100	9,501	-25.3

*Bales under 200 lbs. **Shear-bar type

THE AVERAGE NATIONAL SERVICE MANAGER now receives an annual salary of $37,073, according to a survey conducted by Dr. Steven Langer for the National Assn. of Service Managers. Similarly, the average (mean) salary of regional service managers is $24,206. Field service engineers average $22,212; for field service representatives, it's $19,489. The survey noted that salaries vary considerably from one type and size of employer to another. National service managers for lawn, garden and recreational equipment averaged $30,440. Those for manufacturers of all types with volume under $10 million averaged $30,250. Highest median salary is received by national service managers in direct service firms ($46,500) and manufacturing firms with annual sales of $250 million or more ($44,785).

THE INDUSTRIAL AND CONSTRUCTION EQUIPMENT DIV. of FIEI is going into show business. The division is taking over the International Construction & Utility Equipment Exposition, a bi-annual event most recently held at Olathe, Kan. Next one is set for Aug. 16-18, 1983, at Fairfax Airport, Kansas City, Kan. The show will feature working displays of products primarily for the telephone, power utilities, sewer, water, gas, CATV and street lighting markets. More details are available from Lynn Huffman, ICED manager at FIEI (312/321-1470).

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RETAIL SALES OF WHEEL TRACTORS*
(In Units)

	Total Wheel Tractors†				Cumulative for Jan.-May., 1981				Cumulative for Jan.-May., 1982			
	May 1981		May 1982		Farm Type				Farm Type			
	Farm	Non-Farm	Farm	Non-Farm	2-Wheel Drive	4-Wheel Drive	Total Farm	Non-Farm	2-Wheel Drive	4-Wheel Drive	Total Farm	Non-Farm
Alabama	140	33	84	36	795	18	813	143	481	8	489	106
Alaska	2	5	1	9	11	.....	11	20	7	.....	7	21
Arizona	39	23	23	21	294	26	320	152	208	38	246	163
Arkansas	199	36	154	20	1,142	164	1,306	154	749	72	821	97
California	306	170	266	91	1,707	178	1,885	950	1,262	96	1,358	428
Colorado	90	38	56	25	424	93	517	204	285	64	349	141
Connecticut	16	10	13	14	71	2	73	59	55	1	56	59
Delaware	15	2	3	5	54	2	56	11	44	4	48	17
Florida	164	90	135	41	948	24	972	465	762	18	780	262
Georgia	207	44	138	26	1,089	12	1,101	236	772	15	787	146
Hawaii	4	15	5	1	27	4	31	37	17	2	19	20
Idaho	114	12	75	10	598	98	696	69	360	73	433	44
Illinois	369	58	273	76	1,868	334	2,202	297	1,710	310	2,020	232
Indiana	247	43	197	28	1,018	159	1,177	163	814	168	982	114
Iowa	429	32	307	11	2,444	284	2,728	94	2,022	244	2,266	47
Kansas	233	21	155	8	896	195	1,091	136	922	214	1,136	70
Kentucky	298	33	228	31	1,536	26	1,562	206	1,315	8	1,323	119
Louisiana	237	69	152	39	1,180	114	1,294	313	746	33	779	246
Maine	29	5	21	3	101	3	104	29	107	1	108	15
Maryland	64	43	44	14	226	15	241	164	211	6	217	69
Massachusetts	15	24	9	13	57	.....	57	109	57	.....	57	92
Michigan	299	52	177	34	1,026	157	1,183	279	736	124	860	126
Minnesota	372	33	255	18	1,787	292	2,079	133	1,353	234	1,587	69
Mississippi	227	17	117	14	1,094	93	1,187	130	671	46	717	71
Missouri	361	46	229	29	1,276	124	1,400	201	1,111	104	1,215	131
Montana	96	10	116	7	340	113	453	62	324	115	439	53
Nebraska	274	13	136	9	1,222	126	1,348	55	1,117	118	1,235	45
Nevada	3	9	5	2	43	6	49	50	30	3	33	22
New Hampshire	15	9	20	6	35	.....	35	37	63	.....	63	30
New Jersey	22	50	16	27	97	.....	97	177	99	1	100	114
New Mexico	27	11	19	3	151	14	165	105	164	4	168	37
New York	280	63	133	65	892	74	966	299	651	48	699	248
North Carolina	193	41	180	43	1,193	16	1,209	227	1,006	15	1,021	150
North Dakota	218	9	188	9	761	375	1,136	30	694	371	1,065	46
Ohio	311	56	178	30	1,289	161	1,450	282	894	98	992	144
Oklahoma	250	46	122	58	788	107	895	294	747	90	837	342
Oregon	137	33	77	9	457	46	503	144	390	43	433	40
Pennsylvania	197	85	139	52	815	34	849	368	683	18	701	216
Rhode Island	5	.....	2	3	10	.....	10	16	6	.....	6	8
South Carolina	87	30	66	17	465	12	477	143	364	6	370	92
South Dakota	94	5	83	1	537	113	650	28	546	90	636	23
Tennessee	276	21	141	23	1,132	31	1,163	134	896	21	917	131
Texas	800	294	533	204	3,549	205	3,754	1,476	3,070	128	3,198	1,145
Utah	63	14	25	14	274	14	288	119	186	8	194	81
Vermont	32	5	24	5	115	1	116	23	83	7	90	15
Virginia	163	37	119	31	677	10	687	190	617	14	631	106
Washington	139	44	103	13	580	80	660	152	508	56	564	79
West Virginia	42	9	21	6	140	.....	140	56	125	.....	125	23
Wisconsin	509	38	233	23	1,778	115	1,893	171	1,225	99	1,324	135
Wyoming	35	12	21	13	171	18	189	82	109	26	135	53
U.S. Government	2	4	1	1	6	.....	6	37	3	.....	3	12
Miscellaneous‡	2	88	15	33	97	.....	97	313	119	.....	119	250
TOTAL	**8,748**	**1,990**	**5,833**	**1,324**	**39,283**	**4,088**	**43,371**	**9,826**	**31,496**	**3,262**	**34,758**	**6,545**

Data released July 21, 1982, Farm & Industrial Equipment Institute.

*Figures do not include garden tractors, motor tillers or contractors off-highway types. Report includes units marketed by these firms: Allied Farm Equip. (Leyland Satoh); Allis-Chalmers; Belarus; J I Case; Deere; Deutz; Ford; International Harvester; Long; Massey-Ferguson; R. M. Wade (Satoh); Steiger; Versatile; and White.

†The monthly sales are those reported for that month only. The cumulative totals are subject to revision reflecting updating in the basic sales data.

‡Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

RETAIL SALES OF SELECTED FARM EQUIPMENT – Jan.-May, 1981 and 1982(1)
(In Units)

	Combines Self-Propelled		Corn Heads		Hay Balers(2)		Windrowers Self-Propelled				Grinder-Mixers		Shear-Bar Forage Harvesters(3)	
							Power Units		Total Heads					
	1981	1982	1981	1982	1981	1982	1981	1982	1981	1982	1981	1982	1981	1982
Alabama	41	19	5	3	83	30	.....	1	.....	1	46	29	14	5
Alaska	.....	.....	.....	.....	5	4	.....	.....	.....	.....	1	.....	.....	.....
Arizona	43	19	1	5	29	5	33	9	39	10	2	5	7	5
Arkansas	220	70	1	3	96	24	.....	.....	.....	.....	30	25	3	2
California	120	66	19	13	81	49	147	71	163	85	3	3	26	11
Colorado	89	68	22	41	58	57	42	23	44	25	37	14	8	10
Connecticut	.....	.....	.....	.....	10	6	.....	.....	.....	.....	.....	1	6	6
Delaware	6	5	4	2	3	4	1	.....	1	.....	2	3	1	1
Florida	12	16	8	6	27	18	.....	.....	.....	.....	8	3	5	12
Georgia	100	86	30	21	76	53	.....	.....	.....	.....	51	51	21	13
Hawaii	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Idaho	103	43	1	2	98	50	76	34	76	41	16	13	11	5
Illinois	553	363	471	385	78	51	7	.....	7	– 1	217	135	74	35
Indiana	284	156	263	154	69	37	2	.....	2	.....	137	100	34	25
Iowa	550	389	517	403	79	52	45	17	43	21	493	387	93	61
Kansas	553	372	35	32	96	77	102	58	105	63	97	89	32	38
Kentucky	72	28	43	24	80	42	8	2	7	1	116	117	48	21
Louisiana	73	32	1	1	36	13	.....	.....	.....	.....	5	2	4	4
Maine	.....	.....	.....	.....	9	4	.....	1	.....	1	1	1	5	4
Maryland	17	12	27	15	26	17	1	5	1	6	17	14	13	9
Massachusetts	.....	.....	.....	.....	8	7	.....	.....	.....	.....	.....	1	4	2
Michigan	102	49	76	65	46	34	17	3	16	3	109	83	64	30
Minnesota	333	232	213	171	152	95	110	73	119	83	299	220	122	89
Mississippi	102	30	2	1	55	27	.....	1	.....	1	20	15	8	7
Missouri	229	125	66	57	146	73	18	7	19	7	181	152	34	30
Montana	135	83	2	.....	42	25	66	50	73	61	23	21	4	4
Nebraska	276	251	175	153	41	22	76	57	80	65	193	188	45	51
Nevada	1	.....	.....	.....	6	8	14	4	15	8	2	.....	1	.....
New Hampshire	.....	.....	.....	1	12	6	.....	.....	.....	.....	1	.....	2	4
New Jersey	5	1	5	3	7	13	.....	.....	.....	.....	6	6	3	2
New Mexico	17	5	1	2	45	40	20	13	20	11	6	2	1	5
New York	17	24	27	27	90	81	9	6	10	6	61	41	71	76
North Carolina	54	35	47	39	96	47	.....	.....	.....	.....	64	40	13	15
North Dakota	295	187	11	24	9	7	74	51	82	51	66	48	10	8
Ohio	223	86	188	105	109	90	2	3	2	3	150	108	57	37
Oklahoma	257	202	1	7	167	68	48	34	50	42	41	49	8	2
Oregon	62	26	2	4	82	49	39	29	59	31	11	7	13	7
Pennsylvania	35	28	29	25	143	110	16	11	15	11	119	125	94	68
Rhode Island	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
South Carolina	36	16	6	8	33	21	.....	.....	.....	.....	20	13	10	3
South Dakota	104	60	41	36	9	6	70	60	77	75	109	105	36	29
Tennessee	69	34	16	11	170	66	.....	.....	.....	.....	75	80	40	25
Texas	494	218	51	38	314	132	38	20	48	24	87	89	20	13
Utah	10	6	1	.....	42	44	24	16	22	18	7	5	4	7
Vermont	.....	2	.....	3	20	4	1	.....	1	.....	1	.....	13	29
Virginia	26	20	18	19	88	59	2	3	2	3	30	46	31	29
Washington	97	30	8	2	54	44	40	10	46	11	6	5	25	20
West Virginia	.....	1	.....	.....	35	19	.....	.....	.....	.....	8	10	2	3
Wisconsin	81	53	90	83	291	153	69	44	72	47	255	187	301	189
Wyoming	18	8	3	2	21	20	25	12	26	18	9	7	3	2
U.S. Government	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miscellaneous (4)	.....	.....	12	.....	.....	.....	.....	1	.....	1	.....	.....	.....	.....
TOTAL	**5,914**	**3,557**	**2,539**	**1,996**	**3,372**	**1,963**	**1,242**	**720**	**1,342**	**833**	**3,238**	**2,645**	**1,444**	**1,053**

Data released July 21, 1982, Farm & Industrial Equipment Institute.

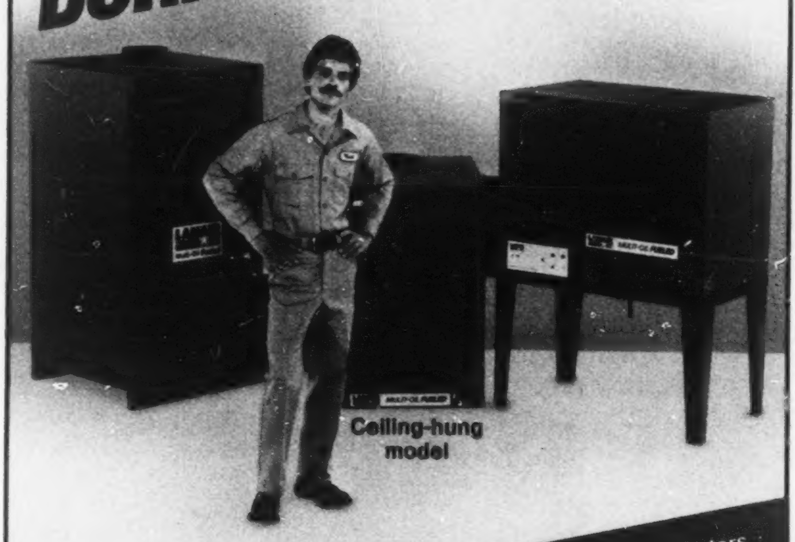
(1) Includes revisions for prior months.
(2) For making bales of under 200 lbs.
(3) Pull-type, mounted, self-propelled.

(4) Sales reported as miscellaneous are retail sales which cannot be classified by state or as U.S. Government. They include sales and dispositions that do not go through usual marketing channels such as gifts to non-profit organizations, intra-plant or company transfers, etc.

Mower Conditioners All Types 1981	Mower Conditioners All Types 1982	Manure Spreaders Conveyor-Type 1981	Manure Spreaders Conveyor-Type 1982	
57	29	8	1	Alabama
2	2	2	.....	Alaska
7	2	2	2	Arizona
167	82	56	41	Arkansas
27	12	26	21	California
36	19	32	24	Colorado
10	17	40	48	Connecticut
1	6	33	11	Delaware
21	23	12	7	Florida
88	66	15	12	Georgia
.....	1	.....	.....	Hawaii
37	12	58	57	Idaho
191	157	308	276	Illinois
149	76	282	201	Indiana
271	158	753	754	Iowa
201	177	80	99	Kansas
267	176	156	148	Kentucky
27	20	9	8	Louisiana
16	8	32	35	Maine
20	28	87	85	Maryland
12	9	43	24	Massachusetts
106	63	376	288	Michigan
229	151	641	666	Minnesota
41	25	12	9	Mississippi
381	271	150	148	Missouri
38	19	13	23	Montana
132	135	107	202	Nebraska
2	2	2	8	Nevada
14	7	21	24	New Hampshire
4	10	23	21	New Jersey
6	4	4	2	New Mexico
174	125	700	637	New York
84	81	53	65	North Carolina
15	19	41	39	North Dakota
172	132	419	324	Ohio
228	173	17	25	Oklahoma
61	25	41	45	Oregon
156	195	606	516	Pennsylvania
.....	.....	.....	2	Rhode Island
48	38	7	12	South Carolina
24	19	105	112	South Dakota
252	235	79	65	Tennessee
409	245	82	66	Texas
34	32	46	44	Utah
25	19	101	96	Vermont
157	169	82	109	Virginia
55	30	50	50	Washington
29	27	34	23	West Virginia
442	255	993	924	Wisconsin
10	4	15	17	Wyoming
.....	.....	.....	.....	U.S. Government
.....	.....	.....	.....	Miscellaneous
4,935	**3,590**	**6,854**	**6,416**	**TOTAL**

Advanced Technology from Lanair.

WHO SAYS YOU CAN'T BURN WASTE OIL?



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With their exclusive new Lanair Computer Command, all six Lanair models can safely and efficiently burn a variety of fuels, including used engine oil, transmission fluid and hydraulic fluid. The Computer Command Control is a wafer-thin 3" x 5" printed circuit that monitors and controls all functions to provide economical, consistent heat output.

Lanair is the No. 1 choice in the U.S. And with six models to choose from, there's a Lanair Multi-Oil Fueled Heater for nearly any auxiliary heating application, for areas up to 12,000 sq. ft. Heaters can be stand- or floor-mounted. And new ceiling-hung units let you meet local codes.

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I&T
SINCE 1886

AUCTION PRICES OF USED EQUIPMENT

An exclusive I&T monthly report of actual prices paid recently at these leading national wholesale auctions.

Asterisk beside tractor price indicates highest bid offered on tractors which were not sold.

JONES FARM EQUIPMENT CO.
Dothan, Alabama
June 8, 1982

ALLIS-CHALMERS TRACTORS

175 diesel, 1971 (Rough)	2200
C, mo., 1944 (Fair)	325
G, cult., 1950 (Good)	1000

CASE TRACTORS

970 diesel, duals, 1970 (Fair)	2950
580 diesel, ldr., backhoe, 1969 (Excellent)	6000*
580 diesel, ldr., backhoe, 1969 (Excellent)	6000
580 diesel, ldr., backhoe, 1969 (Good)	5500*
530 diesel, 1963 (Fair)	525
480 C-diesel, loader, backhoe, 1976 (Excellent)	11,250

DAVID BROWN TRACTOR

880 diesel, 1966 (Rough)	425*

MASSEY-FERGUSON TRACTORS

275 diesel, 1975 (Good)	6200
245 diesel, 1976 (Excellent)	5900
205 diesel, 4-WD 1981 (Excellent)	4850
180 diesel, 1969 (Good)	3250
180 diesel, 1968 (Good)	2350*
180 diesel, 1967 (Good)	3300*
180 diesel, 1965 (Good)	3100*
175 diesel, 1967 (Good)	3600*
175 diesel, 1966 (Rough)	2150
165 diesel, 1969 (Fair)	3250
165 diesel, 1968 (Rough)	2550*
135, diesel, 1967 (Good)	3000*
135, 1966 (Rough)	1950
135 diesel, 1966 (Fair)	2400*
135, 1965 (Good)	3050
50 LP, 1958 (Fair)	1275
35 diesel, 1963 (Good)	2150*
35 diesel, 1963 (Fair)	1750
35, 1961 (Good)	2150
35 diesel, 1958 (Rough)	900
35, 1957 (Fair)	1425
35, 1957 (Fair)	1375*
T020, 1950 (Rough)	625
T020, 1950 (Rough)	550*

FORD TRACTORS

8600 diesel, 1974 (Good)	5750
8000 diesel, 1969 (Fair)	3600*
7600 diesel, 1978 (Good)	7800*
7600 diesel, 1976 (Good)	7300
7000 diesel, 1978 (Good)	7200*
5000 diesel, cab, duals, 1972 (Fair)	3600
5000 diesel, 1972 (Rough)	3300*
5000 diesel, 1970 (Fair)	3600
5000 diesel, 1970 (Good)	4300
5000 diesel, 1968 (Rough)	2250
4000 diesel, 1972 (Excellent)	5000
4000 diesel, 1966 (Fair)	2500
3000 diesel, 1968 (Good)	3150*
3000 diesel, 1966 (Good)	3100*
3000 diesel, 1966 (Good)	2875
1801 diesel, ldr., 1958 (Rough)	1250
1700 diesel, 1980 (Excellent)	4400*
850, 1955 (Good)	2100*
841, 1961 (Fair)	1250
841, 1958 (Good)	2275
650 diesel, ldr., 1975 (Excellent)	6750
641, 1961 (Good)	1975
641 diesel, 1958 (Fair)	1500
631, 1959 (Good)	1600*
Sup. Dexta 1963 (Good)	1275
Sup. Dexta 1963 (Excellent)	2000
Dexta, 1959 (Good)	1500*
NAA, 1954 (Fair)	1400*
Jub., 1953 (Good)	1700*
8N, 6-cyl, 1952 (Fair)	650*
8N, 1952 (Good)	1175*
8N, 1951 (Good)	1050
8N, 1951 (Good)	1025
8N, 1951 (Good)	1150*
8N, 1951 (Good)	1250*
8N, 1950 (Good)	975
8N, 1950 (Good)	1200
8N, 1949 (Good)	975
8N, 1948 (Fair)	800*

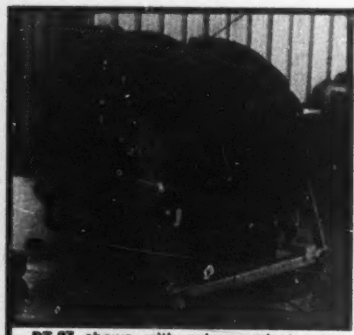
FORD-FERGUSON TRACTORS

9N, 1946 (Good)	925
9N, 1944 (Rough)	410

INTERNATIONAL HARVESTER TRACTORS

1466 diesel, duals, 1972 (Good)	7500*
1466 diesel, 972 (Fair)	4700*
1256 diesel, duals, 1968 (Fair)	3900
1086 diesel, 1977 (Good)	7150
1066 diesel, duals, 1974 (Good)	5800
966 diesel, duals, 1971 (Good)	8000*
2500 diesel, 1972 (Fair)	1250
2500 diesel, 1972 (Fair)	1250
2500 diesel, 1972 (Fair)	1400
2400 diesel, ldr., 1971 (Fair)	2200*
664 diesel, 1973 (Fair)	2350*
2606 diesel, 1965 (Rough)	1000
574 diesel, 1974 (Good)	3600
560 diesel, 1959 (Rough)	625
504 diesel, 1965 (Excellent)	2600

(More...)



DT-27 shown with scissor adaptor to support axle housing.

Safety Versatility Time

Three good reasons to have Cofer Tire Carts in your shop

Model T-21
- single tires
- 6" casters
- with or without axle housing
- 6,000 lb. capacity

Models DT-25 DT-27
- dual or single tires
- 6" casters
- telescoping legs
- adjustable tire support
- 8,000 lb. capacity

Cofer Sales has the right heavy-duty tire cart for your shop. Three models are built to adapt to any size tire. And all three can be hooked up in minutes—by one man. That saves time...and money. Cofer Tire Carts are the safest way to handle tractor tires. For complete information on these and our complete line of shop equipment call or write:

Cofer Sales & Mfg. Co.

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California 94610
U.S.A. Tel. (415) 444 4388

FEMA

Circle (20) on Reply Card

Auctions

(continued)

460 diesel, ldr., 1960 (Good)	1900*
200, plow, 1955 (Good)	800*
140, 1970 (Good)	1650
140, mo., 1963 (Good)	2200
Sup. A., ldr., 1952 (Good)	1300*
A, mo., 1944 (Fair)	350
Cub, cult., plt, mo, 1948 (Good)	1250

JOHN DEERE TRACTORS

4020 diesel, 1971 (Fair)	3800*
4020 diesel, cab, 1968 (Good)	5500
3020 diesel, 1965 (Good)	4500*
3010, 1963 (Rough)	1550
3010 diesel, 1962 (Good)	2550
2640 diesel, 1976 (Excellent)	7800
2630 diesel, 1975 (Good)	5750
2030 diesel, 1973 (Good)	4000
2010, 1961 (Good)	1400*
320, 1957 (Good)	1150
310 diesel, ldr., backhoe (Excellent)	8500*
40, 1953 (Fair)	500
G,. 1950 (Good)	525*
MT, plow, 1952 (Excellent)	825*
M, cult., plt., 1952 (Good)	925

LONG TRACTOR

560 diesel, (Good)	3000

OLIVER TRACTORS

1755 diesel, 1973 (Good)	4000
1650 diesel, 1964 (Fair)	2050
1550 diesel, ldr., 1967 (Excellent)	4500
550 diesel, 1963 (Excellent)	2000
55 diesel, 1955 (Excellent)	1650

YODER & FREY, INC.
Archbold, Ohio
June 8, 1982

INTERNATIONAL HARVESTER TRACTORS

A, 1950 (Rough)	400*
A, plow, 1949 (Fair)	800*
A, 1950 (Fair)	1000
Cub, mo.,	1125
Cub, mo., 1955 (Rough)	1200*
Cub, plow, cult., tiller	725
Cub, cult., 1953 (Rough)	1175*
154 Loboy,	2700
C, 1950 (Rough)	695
H, cult., 1950 (Good)	920
H, 1947 (Rough)	530
H, 1950 (Rough)	475*
H, 1950 (Good)	570
H, cult.,	300
M, 1949 (Rough)	725*
M, 1950 (Rough)	550*
M, 1950 (Rough)	850
M, 1949 (Rough)	550
Sup. M, 1952 (Good)	1075
140, (Fair)	2900
230, 1961 (Rough)	675*
340, 1962 (Rough)	1200
350,	420
400 diesel, 1957 (Fair)	925
434, (Fair)	2550
450, 1957 (Good)	1850
454, ldr., 1974 (Fair)	5000*
460, 1959 (Good)	1770*
460 diesel, 1961 (Fair)	1440*
460, 1960 (Good)	1375
560, 1960 (Rough)	2200*
656, ldr., 1970 (Rough)	3100*
656, 1968 (Fair)	3125*
706, 1965 (Fair)	2850
766, 1975 (Fair)	6250*
766, 1975 (Good)	8350*
806 diesel, 1965 (Fair)	3250*
806 diesel, 1965 (Fair)	4500
806, 1964 (Fair)	3000
826, 1970 (Fair)	4950*
856, 1970 (Good)	4600*
986, 1979 (Good)	15,500*
1066, 1974 (Good)	7200*
1206 diesel, 1965 (Good)	6400*
1256 diesel, 1968 (Fair)	5700*
1456 diesel, 1970 (Rough)	4850*
1466, 1975 (Fair)	5500*
1466 diesel, 1975 (Good)	9250*
1466 diesel, 1975 (Fair)	5100
1466 diesel, 1976 (Fair)	6750*
1468, 1975 (Good)	5300*
1566, 1974 (Good)	9250*
1586 diesel, 1978 (Good)	14,500*
3788,	29,500*

JOHN DEERE TRACTORS

L,	650*
40, cult., 1955 (Good)	1350
620, 1959 (Good)	2250
730 diesel, 1958 (Fair)	1900*
1010, 1962 (Rough)	1700
2010, 1961 (Rough)	1350*
2010, 1961 (Rough)	1235
2010, ldr., 1963 (Fair)	2950
2510, (Good)	4700
3010, 1963 (Rough)	1800*
3010 TBL,	4400
3020, 1966 (Fair)	3100*
4010, (Good)	2600*
4020, 1967 (Fair)	4800*
4020 diesel, 1966 (Fair)	4700*
4020 diesel, 1966 (Fair)	5700*
4020 diesel, 1965 (Fair)	5500*
4020 diesel, 1966 (Fair)	4500
4020, 1965 (Rough)	3250*
4020, 1966 (Fair)	3400
4020, (Good)	2500
4320, 1971 (Good)	9100*
4430 diesel, 1974 (Good)	13,000*
4430, 1975 (Good)	13,000*
4440, 1979 (Fair)	17,800
4520, 1970 (Good)	6400*
4630 diesel, 1977 (Good)	11,500*
4630 diesel, 1976 (Good)	13,500*
4630, 1974 (Good)	11,000*
5020 diesel, 1968 (Fair)	5500*
8440, 1980 (Excellent)	35,500*

CASE TRACTORS

V, 1947 (Fair)	425
VAC,	400
530, 1965 (Fair)	2850*
800, (Rough)	1200*
830 diesel, 1967 (Rough)	1325
830, 1957 (Fair)	1300*
830, 1967 (Fair)	2500*
830 diesel, 1966 (Good)	2400
930 diesel, 1966 (Fair)	3500
930, 1968 (Good)	2450
1270 diesel, 1971 (Fair)	9200*
1270 diesel, 1973 (Fair)	8000*

MASSEY-FERGUSON TRACTORS

Sup. 90, 1959 (Fair)	2300*
135, mo., 1967 (Rough)	2175*
135, mo., 1968 (Rough)	2350
165, 1969 (Fair)	3675
165, 1972 (Fair)	2850
165, 1970 (Good)	3350
165, 1971 (Fair)	3000
165, 1971 (Good)	3625
165, 1968 (Rough)	3550
175 diesel, 1970 (Fair)	3750*
175, 1969 (Rough)	3300
175 diesel, 1967 (Fair)	3250*
245,	7750
1080, 1970 (Good)	5300
1085 diesel, 1977 (Fair)	7100*
40, ldr., 1975 (Fair)	4650
70, hoe, ldr.,	7500*
255 diesel, 1977 (Rough)	4800
25, 1963 (Fair)	2200*

DUAL 800 15 TON SPREADER

IDEAL FOR COMMERCIAL FEEDLOTS

The new **DU-AL 800 SPREADER** is ideal for use in commercial feedlots. But the medium-size dairy, beef, hog and poultry operator will also appreciate DU-AL's rugged construction and quality features — 15-ton capacity, variable speed hydraulic apron with oversize motor and gear box, easy removal of FAST-D-TACH beater assembly without bolts or tools, double aprons with 24,500 lb. per strand tensile strength pintle chain, high flotation 15 x 22.5 tires with tandem oscillating running gear for good ground clearance — important in rough field conditions, heavy duty 27'' diameter main beater with 16 replaceable (rooster comb) paddles, easy access to all components in the drive line. DU-AL also offers the same quality construction in its 205 bushel spreader, 312 bushel spreader, line of loaders, sub-soilers and dump wagon.

CHOICE DEALERSHIPS AVAILABLE IN SOME AREAS.

DUAL

A Division of Core Industries Inc

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DU-AL Mfg. Co. 1000 W. Cherokee, Dept. V-8, Sioux Falls, S.D. 57104-5041

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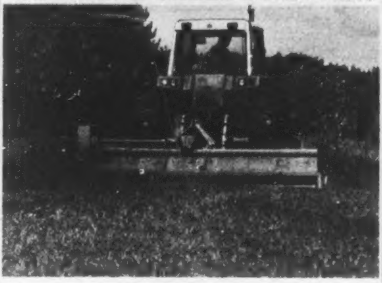
M-C Heavy Duty

Flail Shredder-Mower

FIRST ONE SELLS ANOTHER



- Sizes 7', 8', 10' and 12'.
- Mows— shreds— evenly spreads.
- Lift or pull-type options.
- Vineyard— orchard prunings.
- Mow roadsides— pastures.
- Chops all crop residues.
- Heavy duty throughout.

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MATHEWS COMPANY

500 Industrial Ave., Crystal Lake, IL 60014

Phone: 800 435-6104 TELEX 722 488

Circle (22) on Reply Card

ALLIS-CHALMERS TRACTORS

C, 1948 (Rough)	525*
CA, 1952 (Fair)	1150
WD, 1949 (Fair)	600*
WD-45, Idr., 1952 (Fair)	860
D-14, 1965 (Fair)	1350
D-17, Idr., 1964 (Fair)	1700*
D-21, 1967 (Fair)	4250*
185 diesel, 1973 (Fair)	7100
190XT, 1971 (Fair)	4600
200 diesel, 1973 (Fair)	6800*
210 diesel, 1972 (Fair)	5000*

FORD TRACTORS

8N, 1952 (Fair)	1330
8N,	725
9N, 1947 (Fair)	900
9N, 1945 (Fair)	800
6000 diesel, 1963 (Fair)	3100*
640, mo., 1957 (Fair)	1675
Jub., Idr.,	1450
8600, 1974 (Fair)	6500*
641, 1957 (Good)	2050

OLIVER TRACTORS

88 Sup., 1962 (Fair)	410
1600, 1961 (Rough)	1250*
1600, Idr., 1962 (Fair)	3100*
1750 diesel, 1966 (Fair)	2700*
1750 diesel, 1965 (Rough)	2425
1755, 1972 (Good)	4500
1855, 1973 (Fair)	4400*
1950, 1966 (Fair)	4200*

WHITE TRACTOR

4-150, 1974 (Rough)	10,250*

DAVID BROWN TRACTORS

995, 1978 (Good)	4750*
1200, (Rough)	2300*
1200, (Fair)	2950

MINNEAPOLIS-MOLINE TRACTORS

Jet Star 5, (Rough)	850*
335, (Rough)	775*
G-1000 diesel, (Fair)	3050*
A4T-1600, (Rough)	7200*

COCKSHUTT TRACTORS

E3, 1949 (Fair)	350*
E3, 1948 (Rough)	525

NOTES

Prices reported are for individual sales at wholesale on "as is," "cash and carry" basis.
Prices reported are NOT averages.

Condition classifications: EXCELLENT means—Engine: in perfect condition, 400 to 600 hours of use; Rubber: 80% tread remaining, no breaks or cracks; Paint: original and bright; General Appearance: excellent.

GOOD means—Engine: good running condition; Rubber: 70% tread remaining, no breaks or cracks; Paint: original paint or a good repaint job; General Appearance: good over-all.

FAIR means—Engine: possibly in need of a minor overhaul to restore; Rubber: 60% tread remaining, some cracking evident in side walls; Paint: only fair, weathered and some rust apparent; General Appearance: worn, some dents, minor parts such as gage covers missing or broken.

ROUGH means—Engine: obviously in need of a major overhaul; Rubber: smooth; Paint: scarred, weathered, rusty, needs painting urgently; General Appearance: dents, ruptures, broken parts, loose wires, some components such as lights broken, missing or inoperative.

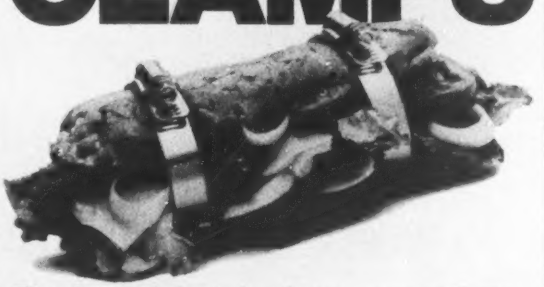
DEMONSTRATOR means—used for demonstrating only and in practically new condition.

Don't sell too low...

and don't pay too much...

stay up-to-date on used equipment values with I&T SINCE 1886

THINK CLAMPS



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the Farm & Industrial Equipment Industry

Implement & Tractor

1982
YEAR OF THE
SALESMAN

3 Locations, 10 Salesmen, 1 Big Inventory: HOW WOULD YOU MANAGE IT ALL?

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Implement & Tractor

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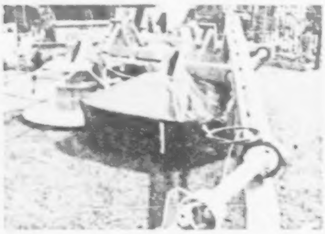
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8: Service Department Expense Allocation. Shop losses can be caused by not recognizing the overhead expenses involved. Here's what to look for.

12: A Long, Royal Look at British Products. British agriculture pulls out all the stops for the Royal Show. I&T reviews the show and some of the products on display.

16: The DLG/Western Canada. I&T takes a quick look at West Germany's DLG and the Western Canada Farm Progress Show.

36: Pumps—Energy Input Devices. Melvin E. Long discusses pump types, ratings, efficiencies and problems. The third article in the series on farm equipment hydraulics.

44: It's Been 75 Years for ASAE. This group of ag engineers celebrated their Diamond Jubilee with a convention on the theme "Food, Fiber, and the Future."

44: New Engine Design Methods, Dual Fueling of Diesels. Frank Buckingham examines two new developments presented at the ASAE convention.

46: Deere Introduces the 1983 Line. I&T Red Book Editor, Chuck McMurray, reports on the latest products from John Deere.

48: Selling from One Big Inventory. With 10 salesmen at three locations, Adrian and Jim Sommer have one of the largest Case dealerships anywhere. For them, sales management is a top priority.

On the cover... It's a big inventory, but with 10 salesmen at three locations, Adrian and Jim Sommer find it just about right for Service Motor Co.

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What's Ahead...

September 1982

U.S. RETAIL SALES THROUGH JULY as reported in FIEI's flash report:

	Unit Retail Sales					
	July			January-July		
	1982	1981	Pct. Change	1982	1981	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
40-100 hp	3,710	5,723	-35.2	25,399	32,466	-21.8
Over 100 hp	2,563	4,848	-47.1	18,623	24,833	-25.0
Total 2-wheel drive	6,273	10,571	-40.7	44,022	57,299	-23.2
4-wheel drive	425	1,014	-58.1	4,195	5,764	-27.2
Total Tractors	6,698	11,585	-42.2	48,217	63,063	-23.5
Combines (S-P)	1,433	2,954	-51.5	6,081	10,667	-43.0
Balers*	2,388	3,192	-25.2	6,169	9,234	-33.2
Forage Harvesters**	605	858	-29.5	2,242	3,111	-27.9
Mower-Conditioners	2,985	3,363	-11.2	10,097	12,864	-21.5

*Bales under 200 lbs. **Shear-bar type.

CANADIAN RETAIL SALES THROUGH JULY were in similar condition: Tractors off 30 per cent at 9,790 units; self-propelled combines off 68 per cent at 355; mower-conditioners off 37 per cent at 1,700 units; round balers off 39 per cent at 1,097; rectangular balers off 38 per cent at 1,233 units.

U.S. TRACTOR AND FARM EQUIPMENT EXPORTS in the first half of 1982 were off 12.3 per cent from the first half of 1981 at $1.361 billion. Major areas of sales decline were Canada (off 18 per cent at $615 million), Mexico (off 25 per cent at $96.6 million), Britain (off 10 per cent at $40.5 million), Belgium (off 38 per cent at $41.2 million) and Venezuela (off 18 per cent at $29.4 million). Business picked up for U.S. exporters in West Germany (up 54 per cent at $48 million), France (up 20 per cent at $70 million), Saudi Arabia (by 45 per cent at $29.6 million) and Australia (by 39 per cent at $137 million). Tractor exports declined by 34 per cent to 10,580 units; dollar volume was off 23 per cent at $318 million. Tractor parts exports were off 7 per cent at $358 million.

TRACTOR AND FARM EQUIPMENT IMPORTS were also down in the first six months--from $846.5 million in 1981's first half to $685.6 million, a 19 per cent decline. Imports were off 20 per cent from Canada to $299 million, by 45 per cent from Britain at $51 million, by 7.6 per cent from West Germany at $97 million, by 41 per cent from Belgium at $19 million, by 28 per cent from France at $18 million and by 7 per cent from Japan at $101 million. Tractor imports declined in dollar volume by 17 per cent to $265 million from $321 million. Unit totals were off about 15 per cent to 36,843. Tractor parts imports were down by 31 per cent to $116 million.

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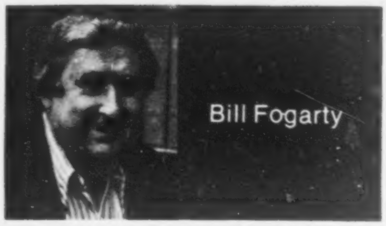
Editor's Notebook


Bill Fogarty

Hay Tools And 'Full-Line' Companies

By now, you've probably heard: International Harvester has sold the patents, designs and tooling for mowers, mower-conditioners and rectangular balers to Avco New Idea for cash. Some IH designs for new products in advanced stages of development are included.

Avco New Idea will make these products at Coldwater, Ohio, and IH will market them through its dealer organization, painted IH red, along with ANI's round balers and rakes, also painted IH red. Avco will also sell these products through its own marketing organization using its own colors.

IH had been making the rectangular balers and mowing tools at its Memphis plant, which it is closing. It will continue to make forage harvesters and windrowers at its Hamilton, Ont., plant.

It's another chapter in IH's struggle to survive. IH aims at narrowing the scope of its operations to a producer of trucks, engines and ag equipment in North America, and to making only ag lines and engines in Europe. Other parts of the plan include closing the Louisville components plant (but keeping the Louisville foundry) and selling the Canton, Ill., implement plant.

The deal with Avco may have been brought on by Harvester's financial strife, but I think something like it might have happened sooner or later anyway. With the exception of Deere, none of the companies in this business which we used to call "full-line" now make more than a few hay tools. Most of them don't make any, and market a few, or they have long since gracefully withdrawn from the race.

The race is thus pretty much left to the hay tool specialists: Sperry New Holland, Hesston, Avco New Idea, Owatonna, Gehl, Farmhand (listed in no particular order) and a host of smaller companies whose hay specialties are even shorter.

The evolution we've been seeing shouldn't be surprising. After all, hay is the one crop that's grown in just about all areas of the U.S. But it is grown differently, to some extent, just about everywhere you go. Or it's handled and used differently.

Thus, hay tools are one of the product families of farm equipment that proliferate in types, varieties and manufacturing companies. For instance, you may be able to tick off the names of everyone making a big baler, but who can possibly identify all the companies that have products for handling big bales?

Back in 1963, when I attended my first FIEI Marketing & Management conference, Dr. E. G. McKibbon, then director of the USDA's ag engineering research division, said something that has stuck with me:

"You must supply the best possible equipment for the production of a certain crop in a specific field of a particular farm in a given region—a difficult task conflicting with volume production and universal distribution, but one which will become increasingly justified."

He knew what he was talking about, didn't he! His vision of the farmer with ever-more-specialized demands and the market clout to get what he wants was prophetic, and this has led to many ramifications that would have been disbelieved 19 years ago.

For instance, in 1971, Harold Halter, then and now executive vice-president of the Farm Equipment Manufacturers Assn., had about 250 regular members and he was predicting a maximum of around 350 companies. But today, there are about 450 companies in that organization, despite the attrition you might expect from mergers, business failures and company shifts into other industries.

The reason is that new companies arise to fill newly created demands in farm mechanization. It's not a matter of scrambling for market share. Instead, they are filling voids that were previously irrelevant or nonexistent but are suddenly important. Companies already in the business either don't see the new opportunities or are otherwise committed in other directions.

Back to hay tools: It has been a long time since the full-line companies were involved in major technological innovations in that product category. But they do play an important role in the creative financing of hay and other machines, and they have dealer organizations. If it weren't for these factors, perhaps the small companies would have blown the bigger ones away a long time ago.

If it's true for hay tools, it would seem to be true for tillage equipment, too. With all the specific, refined demands placed by farmers for equipment to work their fields just the way they want them, how can a full-line company offer much more than a good average implement, useful in many (but far from all) situations?

How Many Dealers Out? How Many Are Still In?

Here's the latest report from the Farm Equipment Manufacturers Assn. about retail dealer attrition. FEMA has again surveyed managers of the regional dealer associations in North America

(More...)

Editor's Notebook
(continued)

concerning the number who have dropped out, whether through bankruptcy or their own choice.

FEMA presented the following table in its member newsletter dated August 1, based on reports from 26 associations:

	1981	Jan.-June 1982
Allis-Chalmers	41	18
J I Case	27½	16
John Deere	27½	12
Ford Tractor	59	23
International Harvester	105	50
Massey-Ferguson	62	50
White Farm	30	12
Shortlines	29	23
Not Identified	36	17
Others	9	8
Totals	426	229

Two weeks later, the FEMA newsletter had some additional data. Four more associations had reported in. One, Alberta-British Columbia, had lost three but gained five in the period for a net increase of two. But offsetting this were three other associations reporting 20 more dealers out of business. Of the 249 net decline, 30 were bankruptcies. According to FEMA, 42 per cent of the total dealers out of business were either IH or Massey-Ferguson.

When I&T got the data from the FEMA newsletter, we asked the public relations offices of the named companies if they wanted to comment. At press time, two had declined comment and we hadn't heard from the others.

What's the universe? At this point, let's take a look at what appears to be the total number of farm and industrial equipment dealers in North America. Then we can judge what kind of attrition rate the FEMA survey discloses.

First, at the NFPEDA convention in Honolulu last month, I was given a list that showed as of June 1 a total of 8,662 paid dealer members among the 29 U.S. associations in the federation. In addition, there are approximately 1,200 to 1,250 Canadian dealers who are members of regional and provincial associations.

This gives us a total of about 9,900 dealers, paid up as of three months ago, right?

Well, almost. It happens that the way things are structured, some regional associations don't report *all* their paid memberships to NFPEDA, at least not right away. So we may have at any given time a few score or maybe a couple of hundred uncounted dealers floating around out there in addition to the ones we know about. So let's estimate 10,000, just to be conservative.

And then there are rules, which vary by association, concerning multiple-location dealerships. One association I know of can point to a few examples of dealers who have three fully operative dealerships with separate supplier contracts, but they are counted as only one member. But that may not be the way it's done in the adjoining state or provincial association.

Another complication: We don't know how many of the dealer-members counted among the paid-ups or among the dropouts are lawn and garden equipment dealers. Some associations have a fair number of such establishments on their rosters; others don't.

And finally, how precise and uniform are the responses to the survey? What if Company A and Company B each have a dealer in a town. Company A's dealer decides to hang it up. Company A's territory manager walks across the street and offers the A franchise to the dealer for Company B, who accepts, keeping the B line. Both companies still have the same number of dealers, but the association has one less member.

But what the heck. Let's say there are 10,000 farm and/or industrial equipment dealerships out there. If there were 426 dropouts in 1981 and another 249 in the first half of this year, I'd say, as does FEMA's Harold Halter, that a decline of 675 dealers is a relatively small percentage, considering how difficult business conditions have been in the past 18 months.

News Briefs

Florida Dealer Wins Grant From NFPEDA Fund in Litigation vs. Ford Tractor

Upon recommendation by its Industry Relations Committee, the board of directors of the National Farm & Power Equipment Dealers Assn. has voted to grant money from NFPEDA's Industry Relations Fund to Hinton James, Jr., dealer principal of Polk Tractor Co., Winter Haven, Fla.

Monies from the fund are granted to individual dealers who are engaged in litigation with manufacturer-suppliers. The Industry Relations Committee, composed of dealers who are members of NFPEDA's board, reviews petitions and makes recommendations to the board, which votes on the request.

James is engaged in litigation with Ford Tractor Operations. Ford Tractor sent the dealership a notice of franchise termination on Sept. 28, 1981, to be effective Oct. 28, 1981.

In a subsequent letter dated Nov. 6, 1981, H. J. Head, then Ford Tractor's general operations manager, North America, told James that the termination of the agreement "was a result of Polk Tractor Co.'s inability to live up to the sales and service obligation in its primary market area...."

Subsequent to receiving termination notice, Polk Tractor sought legal remedy, applying in Polk County (Fla.) Circuit Court for a preliminary and permanent injunction against Ford Motor Co., enforcing the termination, and for damages for breach of contract.

In the complaint, Polk Tractor

(Continued on page 41)

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An exclusive I&T monthly report of actual prices paid recently at these leading national wholesale auctions.

Asterisk beside tractor price indicates highest bid offered on tractors which were not sold.

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Archbold, Ohio
July 13, 1982

INTERNATIONAL HARVESTER TRACTORS

A, 1950 (Rough)	410
A, 1949 (Rough)	650
Cub Loboy, 1965 (Good)	2125*
154 Loboy, 1974 (Good)	1935
H, ldr., 1945 (Rough)	550*
H,	500
Sup. H, 1954 (Good)	850
M, 1950 (Rough)	750
M, 1949 (Rough)	550*
Sup. M TA, 1952 (Rough)	800
Sup. M, 1952 (Fair)	1000*
Sup. M, 1953 (Fair)	850
300, 1956 (Fair)	875
350, 1957 (Rough)	850
400, 1956 (Fair)	1050
454, 1972 (Good)	5000*
434, (Fair)	2500*
434, (Good)	1625
434, 1968 (Rough)	2050
460 diesel, 1958 (Good)	1800
504, 1965 (Rough)	2200*
560 diesel, 1960 (Fair)	1650
560, 1959 (Fair)	1575
560, 1958 (Rough)	1800*
656, ldr., 1969 (Fair)	3600*
656, 1970 (Fair)	2700*
656 diesel, 1967 (Rough)	3200*
706, 1965 (Fair)	2300*
706, 1965 (Fair)	2600*
756 diesel, 1970 (Good)	5950
806 diesel, 1965 (Fair)	3600*
806, 1965 (Good)	2900*
826 diesel, 1970 (Fair)	5250*
966 diesel,	8100
986 diesel, 1979 (Excellent)	14,000*
1086, 1975 (Good)	9200*
1206 diesel, 1963 (Fair)	4000*
1256 diesel, 1967 (Fair)	5300*
1466, 1974 (Fair)	9200*
1466, 1973 (Fair)	6000*
1566, 1975 (Fair)	9500*
1586 diesel, 1979 (Good)	15,000*
4386, 1977 (Fair)	11,250*
4166, 1973 (Rough)	7100*

WHITE TRACTORS

2-105, (Good)	9700*
4-150, 1975 (Rough)	7000*
4-180, 1974 (Rough)	7500
2-30, 1981 (Excellent)	4800*

MASSEY-FERGUSON TRACTORS

TE-20, 1949 (Good)	775
TE-20,	775
TE-20	440
40, 1958 (Good)	2350
40,	1050
50,	900
35 diesel, 1961 (Good)	2300
65, 1961 (Rough)	1200
Sup-90 diesel, 1964 (Rough)	1770*
90,	1425
135, 1969 (Rough)	1935
165 diesel, 1969 (Fair)	2600
165, 1966 (Fair)	3275
165,	3750
165,	2700
165 diesel, 1967 (Fair)	2925*
165, 1968 (Good)	3425
175 diesel, 1969 (Fair)	3100*
175 diesel,	3725
180 diesel, 1969 (Good)	3600*
245, 1976 (Good)	5175
265	7400
265, 1976 (Fair)	6000*
1085 diesel, 1973 (Good)	6300*
1800, (Rough)	8500*
2135, ldr., 1970 (Rough)	3600*
1150, 1969 (Fair)	4800*

DEUTZ TRACTOR

D4006	1900

MASSEY-HARRIS TRACTOR

44, 1950 (Rough)	200

MINNEAPOLIS-MOLINE TRACTORS

M-5, 1960 (Rough)	1300*
1600, (Rough)	6000*
Z-B, 1954 (Rough)	450
U,	190

COCKSHUTT TRACTOR

30, 1950 (Rough)	400

FORD TRACTORS

8N, 1949 (Fair)	1200
8N, 1950 (Fair)	1290
8N, 1952 (Rough)	1150
8N, 1950 (Fair)	1100
8N, 1950 (Good)	1100
8N, 1949 (Good)	1125
8N,	1225
9N, 1945 (Rough)	775
9N, 1946 (Rough)	875
9N, 1945 (Fair)	1225
9N,	850
9N, 1940 (Rough)	625
800, 1955 (Fair)	1675
801,	2700
901, 1956 (Rough)	1400*
3000,	2900
3000, 1972 (Fair)	2700
850, ldr., 1958 (Good)	1925
4000, 1959 (Fair)	2300*

(More...)

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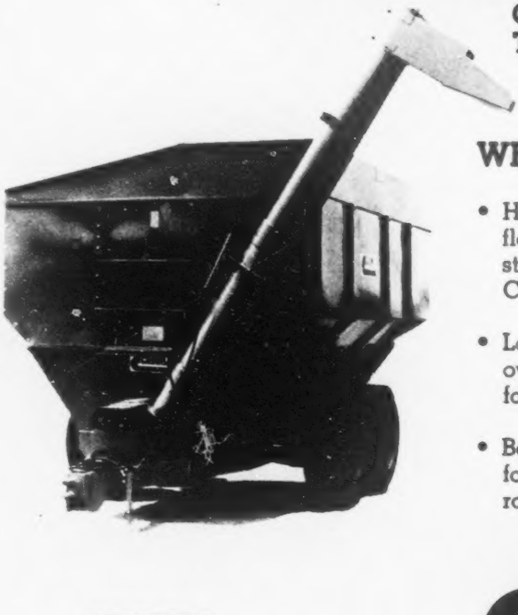

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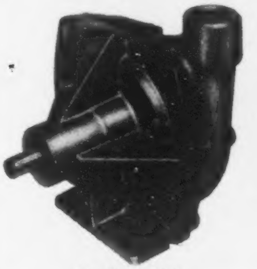

Series 9200

Series 9000

	max. rpm	gpm	at	psi
9300 HM Hydraulic	n/a	119 max. 43		30 80 max.
9000 PTO/Solid shaft	600	130 max. 74		20 70 max.
	1000	124 max. 55		20 70 max.
9200 belt/direct	6000	136 max. 86		40 160 max.

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Auctions *(continued)*

4000, 1971 (Good)	3100*
4000 diesel, 1973 (Good)	4475
4000 diesel, 1974 (Good)	3450
5000, 1973 (Fair)	4700*
8600, 1975 (Fair)	7400*
9000, 1973 (Fair)	7600*
Jubilee, 1953 (Fair)	1350*
Jubilee, 1953 (Fair)	1475*
Jubilee, 1961 (Good)	1475
861, 1959 (Rough)	1325
861,	1370
Sup. Mjr., 1962 (Rough)	600*
4500, backhoe,	3700

DAVID BROWN TRACTOR

1200 deisel, 1969 (Fair)	2200

CASE TRACTORS

411, 1956 (Fair)	1350
530 backhoe, ldr.,	4500
530 backhoe, ldr.,	4300*
800, 1958 (Rough)	700*
830 diesel, 1963 (Fair)	1600
930, 1965 (Rough)	2300*
970, 1972 (Fair)	5000
1070 diesel,	9500
1270, 1973 (Fair)	8000*
SC, 1953 (Rough)	185

JOHN DEERE TRACTORS

B, ldr., 1950 (Rough)	500
L, 1950 (Fair)	700*
70, 1955 (Rough)	700*
70, 1954 (Fair)	950
720 diesel, 1959 (Fair)	1100*
2020 diesel,	4400
2510, 1963 (Fair)	3300
2510, 1964 (Good)	3600*
3020 diesel, 1969 (Good)	5200*
4020 diesel, 1967 (Good)	6200*
4020, 1964 (Fair)	5100*
4020, 1964 (Fair)	4600*
4020, 1967 (Fair)	5000*
4020, 1968 (Fair)	3100*
4020 diesel, 1964 (Fair)	5100*
4020 diesel, 1964 (Good)	4900
4430, 1976 (Good)	13,000*
4430, 1974 (Good)	13,250*
4430 diesel, 1973 (Fair)	12,750*
4630, 1977 (Good)	14,100*
4640, 1981 (Excellent)	28,500*
5020, 1970 (Good)	5200*
6030 diesel,	7900
500, backhoe, ldr.,	6350

ALLIS-CHALMERS TRACTORS

B, 1950 (Fair)	1250*
C,	550
CA, 1952 (Rough)	675
WC,	225
WD-45,	625
D-17, 1965 (Fair)	1490
D-17, 1962 (Fair)	1425
D-17, 1962 (Rough)	1750
D-17, 1961 (Fair)	850*
D-21, 1967 (Good)	4800*
185, 1969 (Fair)	3700*
190XT, 1969 (Fair)	3450
200 diesel, 1974 (Good)	6800*
200, 1973 (Good)	7000*
210, 1972 (Good)	5500*
160, 1968 (Fair)	2600

OLIVER TRACTORS

77,	550
1600, 1960 (Fair)	2700
1600, 1963 (Fair)	2850*
1800 diesel, 1964 (Fair)	2925
1850 diesel, 1967 (Rough)	3100
1855, 1972 (Fair)	4400*
60, 1935 (Rough)	475
55, 1956 (Rough)	935

JONES FARM EQUIPMENT CO.
Dothan, Alabama
July 13, 1982

ALLIS-CHALMERS TRACTORS

6040 diesel, 1974 (Fair)	3750
D14, 1958 (Rough)	550

CASE TRACTORS

2470 diesel, 1974 (Good)	7400
530 diesel, 1964 (Good)	1400

DAVID BROWN TRACTORS

990 diesel, 1965 (Rough)	600
880 diesel, 1963 (Rough)	475

DEUTZ TRACTORS

8006 diesel, (Rough)	1000
6006 diesel, (Good)	4400*

MASSEY-FERGUSON TRACTORS

1135 diesel, cab, duals, 1977 (Excellent)	9100
1100 diesel, 1968 (Rough)	2400*
245 diesel, 1976 (Excellent)	5900
245 diesel, 1976 (Excellent)	6100
180 diesel, 1969 (Excellent)	3700
180 diesel, 1967 (Excellent)	3700
180 diesel, 1966 (Good)	3475
180 diesel, 1966 (Good)	3050
175 diesel, 1974 (Excellent)	3900*
175 diesel, 1971 (Fair)	2650*
165 diesel, 1971 (Good)	3300
165 diesel, 1970 (Good)	3300*
165 diesel, 1968 (Good)	3550*
150 diesel, 1968 (Good)	2600
135 diesel, 1969 (Good)	3050
135 diesel, 1967 (Excellent)	3400
135 diesel, 1966 (Excellent)	3650
135 diesel, 1966 (Good)	3150
135 diesel, 1966 (Good)	3300
65 diesel, 1962 (Rough)	1000
65 diesel, 1961 (Fair)	1450
50 diesel C, winch, 1977 (Excellent)	7000
50, 1962 (Good)	1450
35 diesel, 1963 (Good)	2050*
35 diesel, 1963 (Good)	1750
35, 1958 (Fair)	1300
35, ldr., 1957 (Fair)	1500*
35, 1957 (Good)	1900*
TO30, 1953 (Good)	1225
TO20, 1948 (Rough)	550

FORD-FERGUSON TRACTOR

9N, 1944 (Fair)	500

FORD TRACTORS

9600 diesel, duals, 1975 (Good)	6200
7000 diesel, 1975 (Fair)	4900*
5600 diesel, 1971 (Fair)	5400*
5000 diesel, 1970 (Good)	4000
4410 diesel, ldr., 1968 (Fair)	2050
4000 diesel, 1970 (Rough)	2400*
4000 diesel, 1966 (Fair)	2950
3400 diesel, 1967 (Good)	2900
3000 diesel, 1972 (Excellent)	4400
3000 diesel, 1967 (Good)	2800*
3000 diesel, 1966 (Good)	3350
3000 diesel, 1966 (Excellent)	3600
2000, 1968 (Good)	2600
2000, 1966 (Good)	2300
2000, 1964 (Excellent)	2400
861 diesel, 1959 (Good)	1525
631, 1958 (Good)	1675
631, 1958 (Excellent)	2350

(More...)

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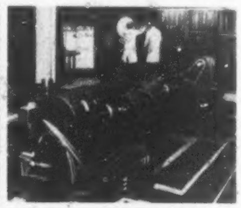

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Midwest Plant: Neapco, Manufacturing Ctr., 501 W. Sargent St., P.O. Box 576, Beatrice, NE 68310. Tel.: (401) 228-4288.

Circle (16) on Reply Card

Auctions *(continued)*

Maj. diesel, 1954 (Fair)	450
Dexta, 1961 (Excellent)	2000
Jub., 1953 (Good)	1650*
Jub., 1953 (Fair)	1300*
8N, 6-cyl., 1952 (Rough)	650*
8N, 1951 (Good)	1300*
8N, 1950 (Good)	1300
8N, 1950 (Good)	1275

INTERNATIONAL HARVESTER TRACTORS

986 diesel, 1976 (Good)	7700*
856 diesel, 1971 (Excellent)	5250*
574 diesel, 1973 (Fair)	2650
544 diesel, 1966 (Good)	2650*
504 diesel, 1967 (Good)	1275*
454 diesel, 1971 (Fair)	2000*
424 diesel, 1965 (Good)	2050
424, 1965 (Fair)	1425*
2400 diesel, 1972 (Fair)	1500
B275 diesel, 1958 (Good)	1100
B275 diesel, 1958 (Fair)	725
Sup. A, 1948 (Good)	950*
Sup. A, cult., 1948 (Good)	1350*
140, plow, cult., 1966 (Good)	2500*
Cub, mo., 1956 (Good)	1400
Cub, mo., 1956 (Good)	900
Cub, mo., 1953 (Excellent)	1700
Cub, cult., plow, mo., 1952 (Excellent)	1525
Cub, mo., 1952 (Excellent)	1700
Cub, cult., plt., 1951 (Good)	1200
Cub, cult., 1949 (Excellent)	1600
Cub, mo., 1948 (Good)	950
Cub, cult., 1948 (Excellent)	1500*

JOHN DEERE TRACTORS

4430 diesel, 1973 (Excellent)	9800
4430 diesel, 1973 (Good)	7050
4020 diesel, 1968 (Good)	5250
3020 diesel, 1965 (Good)	4550*
2940 diesel, 1980 (Excellent)	12,200
2840 diesel, 1977 (Excellent)	9600*
2640 diesel, 1976 (Excellent)	7300
2020 diesel, 1966 (Excellent)	4350*
2020 diesel, 1966 (Excellent)	4200
2020 diesel, 1966 (Good)	3400*
2010 diesel, 1963 (Good)	1850*
2010 diesel, 1963 (Good)	1900
1020 diesel, 1966 (Excellent)	3700
1020 diesel, 1966 (Rough)	850*
510, har., 1957 (Good)	1300
420, 1958 (Good)	875
M, cult., plt., plow, 1949 (Fair)	550

KUBOTA TRACTORS

L245DT, 1978 (Good)	3400
L224DT, ldr., 1978 (Good)	1750

OLIVER TRACTOR

550 diesel, 1964 (Excellent)	2100

NOTES:
Prices reported are for individual sales at wholesale on an "as is," "cash and carry" basis. Prices reported are **not** averages.

Condition Classifications:
EXCELLENT: Engine in perfect condition, 400 to 600 hours of use. Rubber—80% tread remaining, no breaks or cracks. Paint—original and bright. General appearance: excellent.

GOOD: Engine in good running condition. Rubber—70% tread remaining, no breaks or cracks. Paint—original or a good repaint job. General appearance: good over-all.

FAIR: Engine possibly in need of a minor overhaul. Rubber—60% tread remaining, some cracking evident in sidewalls. Paint—only fair, weathered and some rust apparent. General appearance: worn, some dents, minor parts (gage covers, etc.) missing or broken.

ROUGH: Engine obviously in need of a major overhaul. Rubber—smooth. Paint—scarred, weathered, rusty. General appearance: dents, ruptures, broken parts, loose wires, components (such as lights) broken, missing or inoperative.

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and don't pay
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The business magazine of the farm & industrial equipment industry

October 1982
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ew NFPEDA Leaders

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What Do FEMAns Make?

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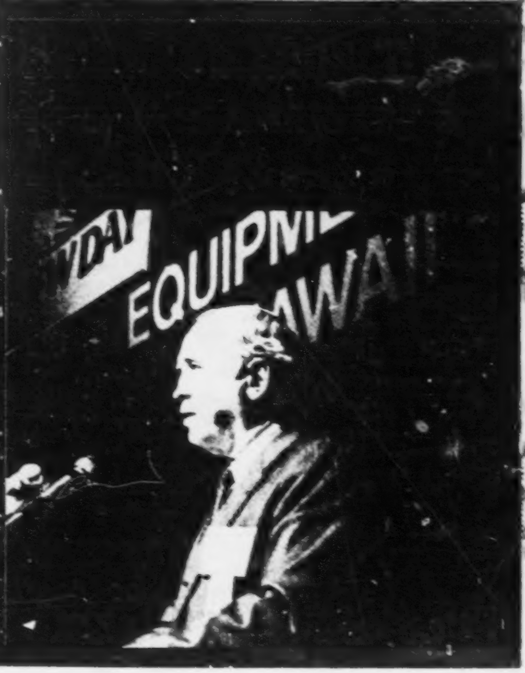
FEMA



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FARM EQUIPMENT WHOLESALERS ASSOCIATION

FEMA

NEW DAYS NEW WAYS
THE KEY TO 83

AIMRA

"Planning Our Productive Future"

[illegible]

Implement &Tractor

The business magazine of the farm & industrial equipment industry

October 1982 • Vol. 97 • No. 18

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11: How Distributors See It. Distributors responded strongly to an I&T survey on issues such as wholesaling and repping functions, new products, liability protection and overseas-made products. Here's what we found.

14: Distributor Scouting Mission to Britain. A British tour with U.S. farm equipment distributors provides a rare opportunity to look at the different approaches to finding new products.

18: What Do FEMAns Make? I&T provides an updated list of FEMA members and products.

26: Previewing Three Important Conventions. A brief rundown on the programming for the FEWA, FEMA, and AIMRA conventions which will all be held in Atlanta starting Nov. 7.

32: The Chatten Experience... This Case dealer tells how he has been successful in combining agricultural and construction lines. A *1982: Year of the Salesman* feature article.

36: Valves – Energy Control Devices. Melvin E. Long explains how valves control energy flow by direction, pressure, and amount. Part Four in the series on farm equipment hydraulics.

54: NFPEDA 83rd Annual Convention. I&T highlights the dealers' positive attitudes at this convention in Honolulu.

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INTERTEC PUBLISHING CORP.

What's Ahead...

I&T
SINCE 1886

October, 1982

U.S. RETAIL SALES FOR AUGUST, according to the Farm & Industrial Equipment Institute flash report, continued their downward trend:

	Unit Retail Sales					
	August			January-August		
	1982	1981	Pct. Change	1982	1981	Pct. Change
Farm Wheel Tractors:						
2-wheel drive						
40-100 hp	2,926	3,234	- 9.5	28,257	35,700	-20.8
Over 100 hp	1,649	3,027	-45.5	20,273	27,860	-27.2
Total 2-wheel drive	4,575	6,261	-26.9	48,530	63,560	-23.6
4-wheel drive	382	645	-40.8	4,577	6,409	-28.6
Total Tractors	4,957	6,906	-28.2	53,107	69,969	-24.1
Combines (S-P)	1,309	2,412	-45.7	7,389	13,079	-43.5
Balers*	987	1,608	-38.6	7,170	10,842	-33.9
Forage Harvesters**	592	879	-32.7	2,842	3,990	-28.8
Mower-Conditioners	1,236	1,800	-31.3	11,303	14,664	-22.9

*Bales under 200 lbs. **Shear-bar type.

INTERNATIONAL HARVESTER HAS SOLD ITS INTEREST IN STEIGER TRACTOR CO. to Deutz Corp., the Atlanta-based unit of Klockner-Humboldt-Deutz AG, Cologne, West Germany. The interest, 1 million shares worth $6.75 million, is 29 to 30 per cent of Steiger. The marketing agreement between IH and Steiger, under which Steiger sells its tractors through certain IH dealers and compensates IH for such sales, continues unchanged. Deutz Corp. sells air-cooled engines, farm tractors and hay tools. (IH also recently announced an agreement in principle for the cash sale of its construction business to Dresser Industries, Inc., Dallas, Tex.)

NORTH AMERICAN AG TRACTOR RETAIL SALES IN 1982: 103,000; IN 1983: 107,000; BY 1986: 149,750 (excluding under-40-hp models). Thus forecasts Jerry Anderson of Bernstein & Co., New York investment firm. For combines: 21,500 in '82; 22,500 in '83; 31,000 in 1986. Allis-Chalmers Corp. farm equipment sales are expected by Anderson to drop from 1981's $700 million to $480 million this year, then rebound to $610 million in 1983 and $1.05 billion by 1986. Deere & Co. farm equipment sales, $4.665 billion in 1981, are predicted to be $4.348 billion this year, $4.724 billion in 1983 and $7.352 billion in 1986.

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HOW DISTRIBUTORS SEE IT

Strong response to I&T survey touches on the wholesaling and repping functions, on new products, on liability protection, overseas-made products and other concerns.

By Bill Fogarty and Ann Thorne

Distributors Consider Overseas-Made Products
(figures are percentages of response)

Product Concern	More than Adequate	Adequate	Less than Adequate
Product reliability	41.3	50.5	8.2
Quality of sales representation	9.2	59.3	31.5
Level of market research	8.4	38.3	53.3
Quality of service backup	9.0	50.0	41.0
Training levels	4.6	44.5	50.9
Parts availability	10.4	49.0	40.6
Price attractiveness	41.6	43.3	15.1
Willingness to advertise	16.8	50.5	32.7
Literature, manuals, other written communication	17.7	47.0	35.3

■WELL, I&T has gone and taken another survey. Yes, we know what a pain in the neck they can be, especially when somebody surveys us...and the questions are long, hard to answer and *dumb*.

But this time, we're not apologizing, because we must have asked something right.

I&T developed a short survey about a few points that interest us concerning shortline equipment distribution and mailed them to member companies of the Farm Equipment Wholesalers Assn. and the Agricultural & Industrial Manufacturers Representatives Assn. We sent out 299 questionnaires.

And when we stopped counting, we had 148 responses. About 25 more replies came in after we had to cut it off.

Function

We divided the responses into two piles—wholesaler and rep, according to how the first question was answered: *Please indicate if your business is primarily wholesaling or repping*. Seventy-six respondents were wholesalers, 72 were reps.

We asked the wholesalers to indicate if they do any repping. Fifty-one per cent said they don't, 49 per cent said they do.

Likewise, 64 per cent of the reps said they don't wholesale, 36 per cent said they do.

Comment: First, remember that ~~these responses in~~ no way disclose the extent to which a wholesaler reps or a rep wholesales. For most, the extent is probably very limited.

It does indicate that when it comes to getting a product to the marketplace, particularly in the present economy, the manufacturer and the distributor are going to work out what is mutually most acceptable, most workable.

More/fewer products

We asked how many new products the respondents had taken on in the last two years. We found that the reps were more likely to have taken on new products. Ninty-seven per cent had added to their lines, compared with 88 per cent of the wholesalers. In both groups 80 per cent added one to six new products. Of these new products 70 per cent of the respondents said more than half of the products were completely new, not merely a mild upgrading or replacement for something already in the catalog.

Both groups dropped fewer items than they added. Thirty-two per cent of the reps did not eliminate any products. Fifty-eight per cent dropped one to three, and only 7 per cent dropped more than four. Of the wholesalers, 9.2 per cent did not eliminate any products, 38 per cent dropped one to three products, and 30 per cent dropped four to six products.

Product innovations

Our next question asked the respondents to assess the number of innovative new products coming on the market today. Forty-seven (65 per cent) of the reps and 35 (46 per cent) of the wholesalers thought there were about the same number of innovations as in the past. However, 33 (43.4 per cent) of the wholesalers and 10 (13.8 per cent) of the reps thought there were less.

One wholesaler, Gene Ashley, Southern Plow Co., Dallas, Tex., commented, "It's a shame that almost all new concepts in equipment are coming from Europe." He speculates on what it is that is keeping the shortline manufacturers in the U.S. from keeping up, and suggests that perhaps federal regulations, labor costs and a growing dependence on staple products are hampering the development of new equipment.

Demand for services

Both the wholesalers and the reps reported an increase in the number of manufacturers who are seeking their services. Eighty-three per cent of the reps and 63 per cent of the wholesalers have observed an increase. Of the remaining respondents, most perceived the requests for service to have remained the same, with only 6 wholesalers (8 per cent) and one rep (1 per cent) who thought there has been a decline.

Product liability

The majority of both wholesalers (73.7 per cent) and manufacturer's reps (75 per cent) require a contract with their suppliers for protection in matters of product liability. Most of those who said they don't require contracts commented that they would like to have them, but were unable to get one, or that they thought a verbal assurance of product liability was as good as a written one. One rep said he had his own in-

(More...)

surance, and another commented that his contracts varied from product to product.

Overseas products

We asked the distributors a few questions about overseas-made products. If a European- or Japanese-made piece of farm equipment is going to make it in North America—for anything short of a combine or a big-horsepower tractor line—it will usually fall to wholesalers and manufacturers' reps to get things started and to grow.

At any given time, how many of the industry's wholesalers and reps are involved in handling overseas-made products, and to what extent?

Of our 76 responding wholesalers, 60 handle such items and 16 do not. For the reps, the number is smaller: 32 do and 40 do not. We asked them to indicate what percentage of their sales came from overseas products, and here's how it came out (presented both as number of responses and as percentage of responses):

Pct. of Sales Volume	Wholesalers	Representatives
None	16/21%	40/55%
1-5	16/21%	11/15%
6-10	9/12%	3/4%
11-15	5/6%	3/4%
16-25	16/21%	5/7%
26-50	9/12%	8/11%
51-100	5/6%	2/4%
Totals	76/100%	72/100%

We asked them to indicate if this level of activity represented an increase, percentage-wise, a decrease or about the same proportion as five years ago. Among the wholesalers, 32 were handling more, 15 handling less and 13 about the same. Among the reps, 17 were handling more, six less and nine about the same. In addition, some wholesalers and reps had been handling overseas-made farm equipment five years ago but were not handling any as of August, 1982.

Also on the subject of overseas-made products, we asked the wholesalers and reps to give us generalized opinions about them. Specifically, we asked for ratings of overseas manufacturers' performance in nine important areas—not against or in comparison with North American manufacturers but *in comparison with what it takes to make it on the North American market.* See the table with this article.

Comment: If this report falls into the hands of some overseas farm equipment makers who have dreams about getting a piece of the North American market, we suggest they study the table of responses closely.

The people who are doing the rating, remember, are the ones who have to sell those imported products and keep them sold. These wholesalers and reps have a tremendous motivation to put these lines across.

Dealer attrition

We asked the respondents to assess the rate of dealer attrition in the last 18 months. The reps sustained the greatest losses with 30 per cent marking that they had experienced a considerable loss, compared with 18 per cent of the wholesalers. On the other hand, more wholesalers (71 per cent) than reps (50 per cent) marked that they had taken some loss. Five per cent of the wholesalers and 18 per cent of the reps experienced little or no loss.

Twenty-six per cent of the reps thought the loss had a considerable effect on their sales volume, compared with 10 per cent of the wholesalers. Forty-five per cent of the reps and 60 per cent of the wholesalers felt a moderate impact, with 25 per cent in both categories who did not think the loss of outlets had affected their sales volume.

The seriousness of dealer attrition elicited a number of comments, some of which were pessimistic. One wholesaler said he had experienced a 30 per cent loss of dealerships in his area in the last two years. A rep noted that there had been a loss of 20 dealers in Kentucky and Tennessee in just the last six months. Some of the respondents considered the losses to be mainly of marginal dealerships, but one rep wrote, "It's just time to get out."

Several respondents noted an increase in the number of shortline dealers. They argued that shortlines offer a better opportunity for profits today because of the weak market for big ticket items.

Some respondents were still optimistic about the future of the industry. Joe Murray, a rep, summed up the optimist's view in the conclusion of his note: "It will be a great market when the cycles reverse. I intend on being one independent rep that survives and prospers on the up side of the market."

Industry in Motion

Southeast Mfg. Co., Joplin, Mo., has completed the purchase of Independent Mfg. Co., B/J Mfg. Inc., and I.M.C.O. Enterprises, Inc., Neodesha, Kan. Southeast will continue to use the IMCO and Big Ox names and in most areas will retain the same sales representatives.

Ingersoll Products Corp., Chicago, Ill., has appointed Arthur C. Fultz, Jr., as sales manager in a 13-state Southern region. He replaces Joseph Raklovitz who is retiring this year after 36 years with the company.

Ralph L. Notch has been appointed vice-president, international sales and marketing, of the **Hypro Div., Lear Siegler, Inc.,** New Brighton, Minn.

Wayne Worth has been appointed Kansas and Missouri sales representative for **E. L. Caldwell & Sons, Inc.,** Corpus Christi, Texas.

Ford Tractor International Operations, Troy, Mich., has named Meldrum and Fewsmith, Inc., Southfield, Mich., as its advertising agency.

The **Stauff Corp.,** Waldwick, N.J., manufacturer of hydraulic systems and accessories, has opened a new regional facility in Plano, Texas. The new office includes a 5,500-sq.-ft. warehouse and will serve the states of Texas, New Mexico, Oklahoma, Arkansas, Louisiana and Mississippi. Dave Pellerin is regional sales manager.

Dennis Schwitters has resigned as president of **Vicon Farm Machinery, Inc.,** Chesapeake, Va. Vicon N.V. of Nieuw Vennep, Holland, the parent company, will reorganize the U.S. firm into three independent companies as of Jan. 1, 1983. Schwitters is a director of the Farm Equipment Manufacturers Assn.

Some 100 sales persons for **Dixon Industries,** Coffeyville, Kan., attended Dixon's Ninth Annual Sales Meeting, August 1-3, at the Kansas City Marriott, Kansas City International Airport.